FLIGHT

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A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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Lieut. Parke flying the new Army Avro biplane over the sheds at Brooklands recently.

EDITORIAL COMMENT.

Wilbur Wright.

It is with the deepest regret that we have to record the death of Mr. Wilbur Wright from typhoid fever. His passing hardly comes as a surprise, for it has been fairly obvious from the cabled reports of his illness that there was very little hope of his recovery from the first. Mr. Wilbur Wright, in conjunction with his brother Orville, may very justly be said to have been the father of dynamic flight. It is true that there were contemporary workers who achieved a fair measure of success, but it is to the brothers Wright that we owe flight as we now know it. In the face of every discouragement, and despite the plain-spoken accusations of departure from the truth when they allowed certain news of their achievements in flight to become known, they persevered with their self-imposed work of wresting the secrets of the air from Nature until they were ready to come out into the light and demonstrate that at last, after centuries of vain striving, man was able to emulate the birds and actually to fly.

Wilbur Wright was of the type of which pioneers are made. Strong, insistent and possessed of that infinite capacity for taking pains, which has been defined as genius, he set himself out for the solution of a problem—and solved it. It is characteristic of the man and his brother that during the time they were engaged upon its solution they said little and denied or confirmed nothing until they were ready. It was due to this secretiveness that the impression got abroad that by the inspiration of sensational accounts of their doings they were mere seekers after advertisement, and a greater injustice was never done to sincere workers in the cause of progress than by this impression. However, that is all past and done with, and when the time came for the brothers to demonstrate to an astonished world the full fruits of years of patient labour and research, they were accorded the full credit due to their marvellous discoveries in the realms of flight and took their places as the acknowledged leaders of aviation.

Unlike too many pioneers of new industries, they, fortunately, were able to reap the reward of success, but how far that same success led to the premature death of Wilbur Wright we shall probably never know. The worry of continuous litigation in the endeavour to uphold the patent rights must have had its effect on a constitution which was never too strong. But it scarcely matters now; all we are concerned with at the moment is the tribute to a brilliant genius who has been taken from among us just at a time when he should have been able to settle down to enjoy his reward. His death is in the sense of a personal loss to all who have any connection at all with aviation. To his family and personal connections we tender our most sincere condolences with their grievous loss.

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Dangerous Crowds at Flying Grounds.

The one thing that stands out clearly in connection with the recent accident at Amesbury, which involved the death of a boy and injuries to other people is the necessity for some power of control over the sight-seeing crowds who visit flying grounds. At the inquest all the evidence went to show that the accident was due to no other cause than that of the crowd insisting on getting so close to landing aeroplanes as to be dangerous to themselves and to the aviators operating the machines. Lieut. Burchardt-Ashton, who was piloting the biplane which was involved in this particular accident, said that people constantly ran in front of landing machines, and the flying school officials had a great deal of trouble in keeping the crowds from trespassing on the landing approach. Mr. Pizey followed with evidence to the same effect. But everyone whose business it is to frequent flying grounds knows of the difficulty which was spoken to—the trouble is to find a remedy. In his summing-up the coroner said that if the proprietors of flying grounds had no power to keep people off, they ought to be given it. That is well enough in its way, but short of a cordon of police or soldiers it is a little difficult to see how the power is to be enforced even after it has been conferred. The only remedy seems to lie with the public, which must learn that danger must be regarded as lurking in the way of machines taking off or landing.

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K.Y.E.O.D.

A couple of years ago all British motordom was started wondering by the appearance of certain mysterious advertisements which simply consisted of the letters "K.Y.E.O.P." When the mystery was elucidated it was discovered that these letters simply meant "Keep your eye on Paisley." Why the advice was given does not matter now, but the style of the advertisement is brought to our mind now by the constantly recurring thought of possible developments in dirigible construction. A little time since we counselled that the military advisers of the Government should not altogether ignore the possibilities of the lighter-than-air craft and recent happenings—again in France—lead us to emphasise that advice. "Keep your eye on dirigibles" is an excellent maxim at the moment when the success of the aeroplane threatens to dwarf the splendid work which is being done by the rival type. On the occasion of the aerial review the French military dirigible *Capitaine Ferber* voyaged from Issy-les-Moulineux to Toul, 300 kiloms. in $5\frac{3}{4}$ hours. This is a remarkable flight when it is considered that it was made practically to a time-table and was effected absolutely without incident of untoward character. Compared with performances standing to the credit of aeroplanes, neither the distance nor the time occupied is startling, but it must not be forgotten that the functions of each type are distinct and their separate performances tend to balance the merits of each. Then again the height record of "Clement-Bayard III" last month when she reached 9,513 ft. is another step forward in practical politics for the dirigible.

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An Interesting Ceremony at Hendon.

AT the Hendon Aerodrome on Sunday last, General Arbuthnot, on behalf of the Aerial League of the British Empire, presented the Gold Medal of the League to the Green Engine Co. for the performance of a 60-h.p. Green engine in winning the Alexander Motor Competition. While emphasising the need for silent engines the General's speech was interrupted by the noise from a passing French machine, thus adding point to his remarks. Mr. Fred May, in returning thanks to the League on behalf of the Green Engine Co., expressed the hope that the day was now approaching when the British manufacturer would cease to go abroad for his engines.

He thanked Mr. Cody for flying over from Farnborough specially to demonstrate the capabilities of the Green engine, and also thanked Mr. Grahame-White for kindly placing the aerodrome at the disposal of the League for the purpose of the presentation.

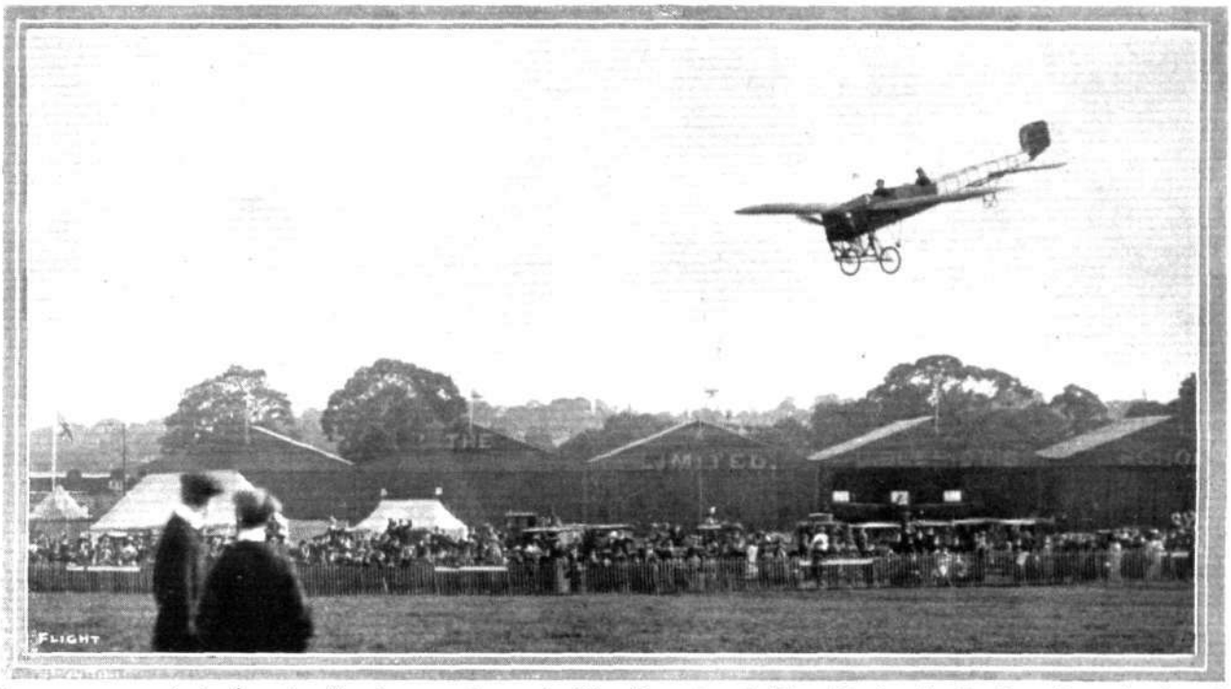
Mr. Cody, in his inimitable way, started to propose a vote of thanks to Gen. Arbuthnot, but apparently forgot his purpose, and treated his hearers to an account of the Michelin prizes the Green engine had helped him to win. Reminded of his purpose, he apologised for his digression, and proposed a vote of thanks to Gen. Arbuthnot, which was heartily accorded. Mr. Cody then gave a practical demonstration of the capabilities of the Green engine by flying several circuits.

FLIGHT

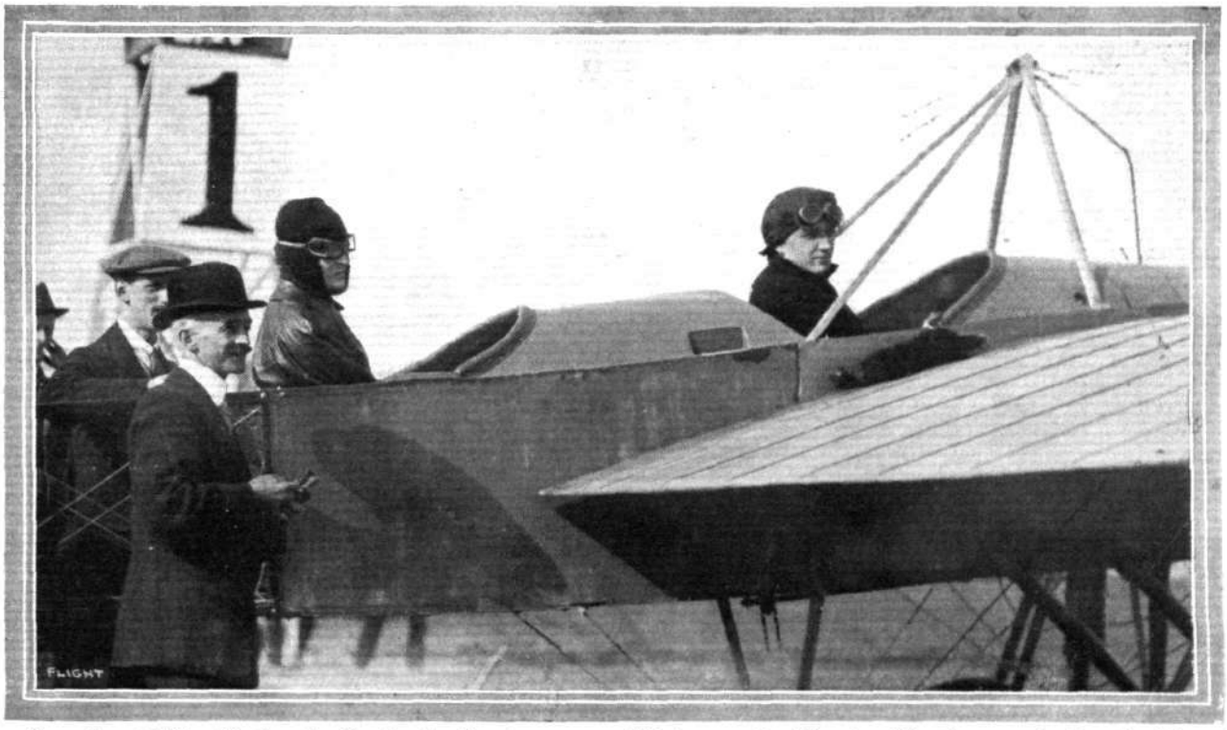
WHITSUN MEETING AT HENDON.

IT seemed at first that the opening day of the second London Aviation Meeting at Hendon would be a blank as far as contests were concerned, for although the wind was only averaging 20 m.p.h., it was unpleasantly gusty. However, things bettered a little later in the afternoon and a good day's work was got through. Grahame-White opened the proceedings at 3.45 p.m. with a few circuits on the Howard Wright "bus" No. 10, finishing up with one of his alarming *vol planés* over the Blériot sheds. Just before 4 o'clock Hamel's new Blériot two-seater, in which he flew with Miss Trehawke Davies from Eastchurch, was brought out and the engine run for a few minutes; Valentine also tested the engine of his Bristol monoplane, and then made a flight of about three minutes. In the meantime, Grahame-White was up again for another short flight on the Howard Wright and indulged in another *vol plané* over the sheds.

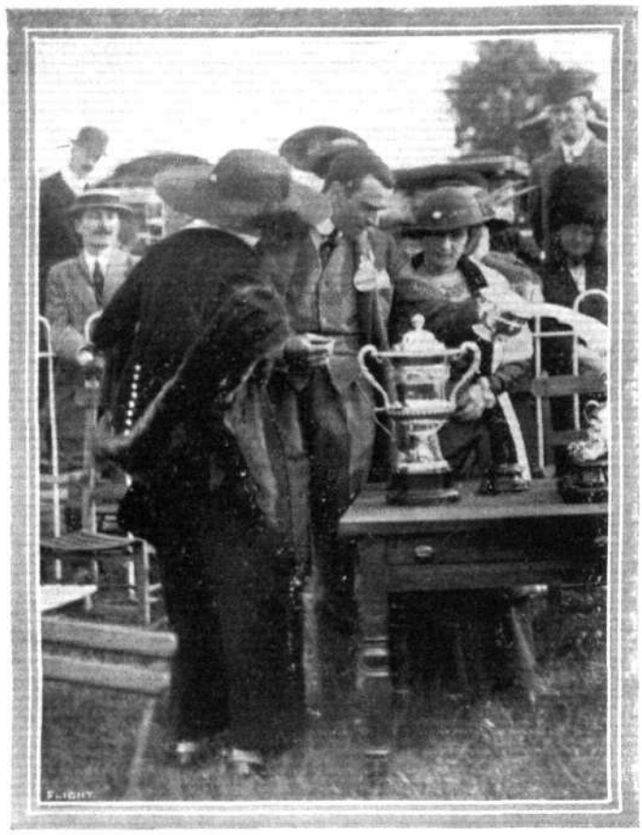
The first event was the cross-country handicap to Elstree and back—once only, owing to the nasty wind—in which there were three starters. These were, Turner (Howard Wright biplane No. 10), Valentine (Bristol monoplane, No. 14) and Hamel with Miss Davies (Blériot monoplane No. 3). Hamel was scratch,



The return *en vol plané* to the Hendon aerodrome by Mr. Hamel and Miss Trehawke Davies, after winning the Altitude Competition at the Whitsun Meeting.



Mr. Hamel and Miss Trehawke Davies in the two-seater Blériot at the Hendon Meeting, ready for the Altitude Competition. Standing on the left is Mr. N. Chereau, the British chief of Bleriots.



Some of the "pots" for competition at the Hendon Whitsun Meeting.—Mr. Claude Grahame-White pointing out their objects to Miss Taylor.

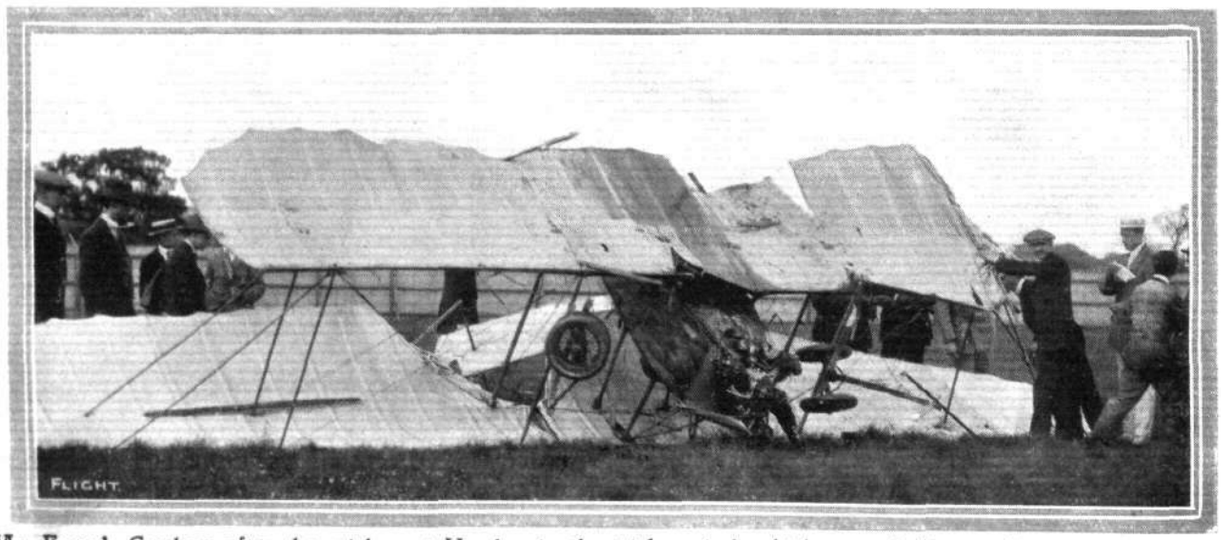
W. H. Ewen on the little Caudron at the Hendon Meeting.

giving Turner 6 min. 3 secs., and Valentine 1 min. 42 secs. Valentine won this event by 6 secs., Turner being second. Just as the competitors were coming back, Ewen started on his little Caudron monoplane—the "Cow-scratcher." He only put in a short spin, but just sufficient to show its remarkable speed.

The next event was the altitude contest, which started about 6 o'clock. Hamel, with Miss Davies, and Valentine were the only two entrants, the latter retiring after he had been up only a few minutes, his height not being recorded. Hamel's height was given as 4,000 ft., although it was without doubt a good deal more. While this contest was in progress there were five machines in the air at one time—Grahame-White on the Howard Wright, Turner on the Farman, Ewen on the Caudron biplane, and, of course, Hamel's Blériot, and Valentine on the Bristol monoplane.

The final event was the speed handicap, exhibition flights having been previously given by Grahame-White and Ewen (on the Caudron biplane). This event was held in two heats of four laps each and a final of six laps. Turner on the Howard Wright biplane, with 1 min. 34 secs. start, and Ewen on the Caudron biplane flew the first heat. Valentine on the Bristol monoplane, 35 secs. start, and Hamel with Miss Davies on the Blériot were in the second. Turner won the first heat and Valentine the second. Hamel, seeing that he could not finish first, cut across the ground and crossed the line considerably in advance of Valentine, much to the puzzlement of the spectators, some of them thinking he had won. In the final, Valentine, who gave Turner 3 min. 47 secs. start, finished 18 secs. ahead of the latter.

This finished the day's programme, except for numerous passenger flights by Turner on the "bus," and by 7.30 p.m. nearly all the visitors had departed. A small number remained, however, on the

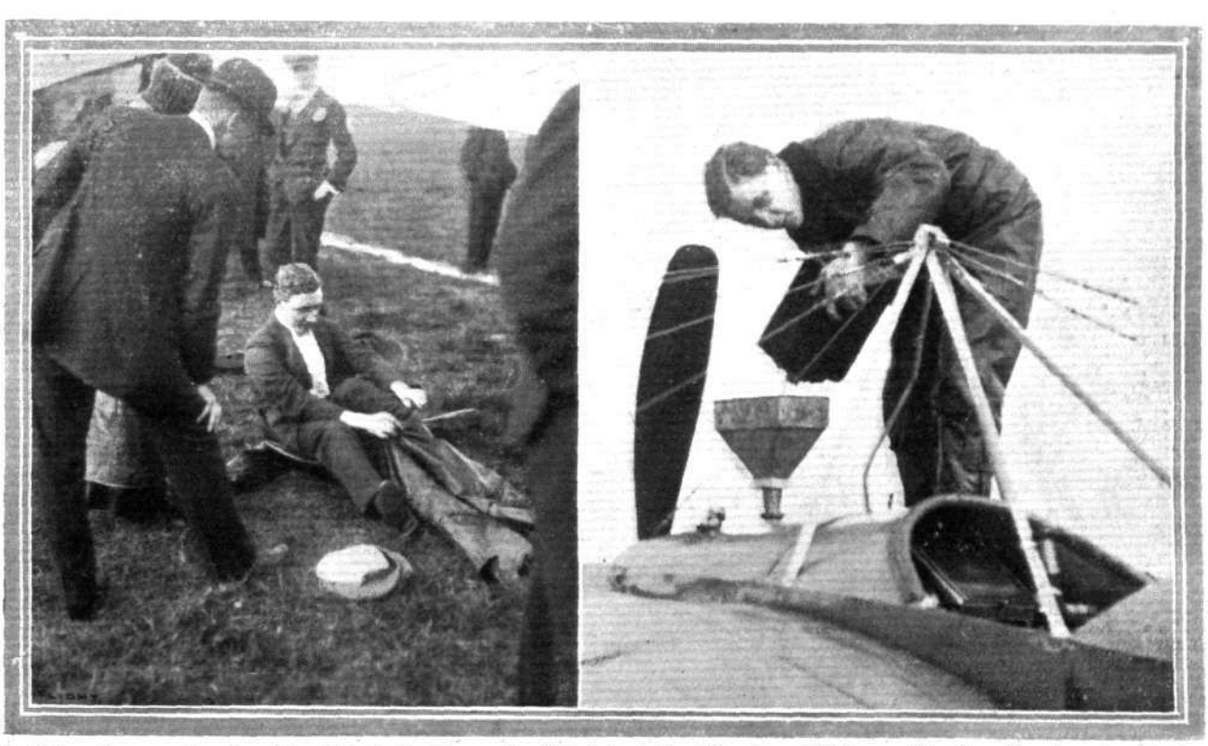


Mr. Ewen's Caudron after the mishap at Hendon in the tricky wind which turned his machine completely over, with, fortunately, no serious consequences to himself.

Miss Trehawke Davies, who has done so much cross-country flying with Mr. Hamel, crossing the flying ground at Hendon at the Whitsun Meeting for Mr. Hamel's flight in the Altitude Competition. On the right, Miss Davies is in the passenger's seat of the Blériot.

chance of seeing Hucks arrive from Bath, it having been announced that he had left for Hendon at 6.5 p.m. Those who did remain spent the time in watching the two-seater Blério being packed on a lorry previous to being taken to Coventry. At intervals of five minutes or so rockets were sent up to indicate the position of the aerodrome for Hucks. Petrol bonfires were also lit, but still Hucks did not arrive. After 9 o'clock it was decided that he would not come that night, so the fires were let burn out and everyone went home.

Sunday, which was a glorious day, and not quite so windy as the day before, was devoted to exhibition and passenger flights, one of the passengers taken being Danny Maher, the well-known jockey. The event of the afternoon, however, was the arrival of Cody from



Mr. Hamel preparing for his altitude flight on the Blériot at the Hendon Whitsun Meeting by donning his new leather overalls and replenishing his tank.

Aldershot on the "Circuit" biplane. He did the journey, which is considerably over 40 miles, in 1 hour 13 mins. He said the wind was very bad, keeping him working the whole time, and he felt quite numbed and cold, so he was marched off to have some tea. After this, General H. T. Arbuthnot, of the Aerial League, presented the Alexander prize to the Green Engine Co. When this had been done and the speeches were over, Cody was taken for a passenger trip in the Howard Wright. Cody then gave one of his remarkable *exhibition flights—grass cutting, as somebody called it. He flew* very low, banking on the turns so that the wheel at the end of the lower plane ran on the ground; then he came along the "straight" with a series of curious hops. The rest of the evening was devoted to short exhibition flights by Messrs. Turner, Ewen and Hucks.

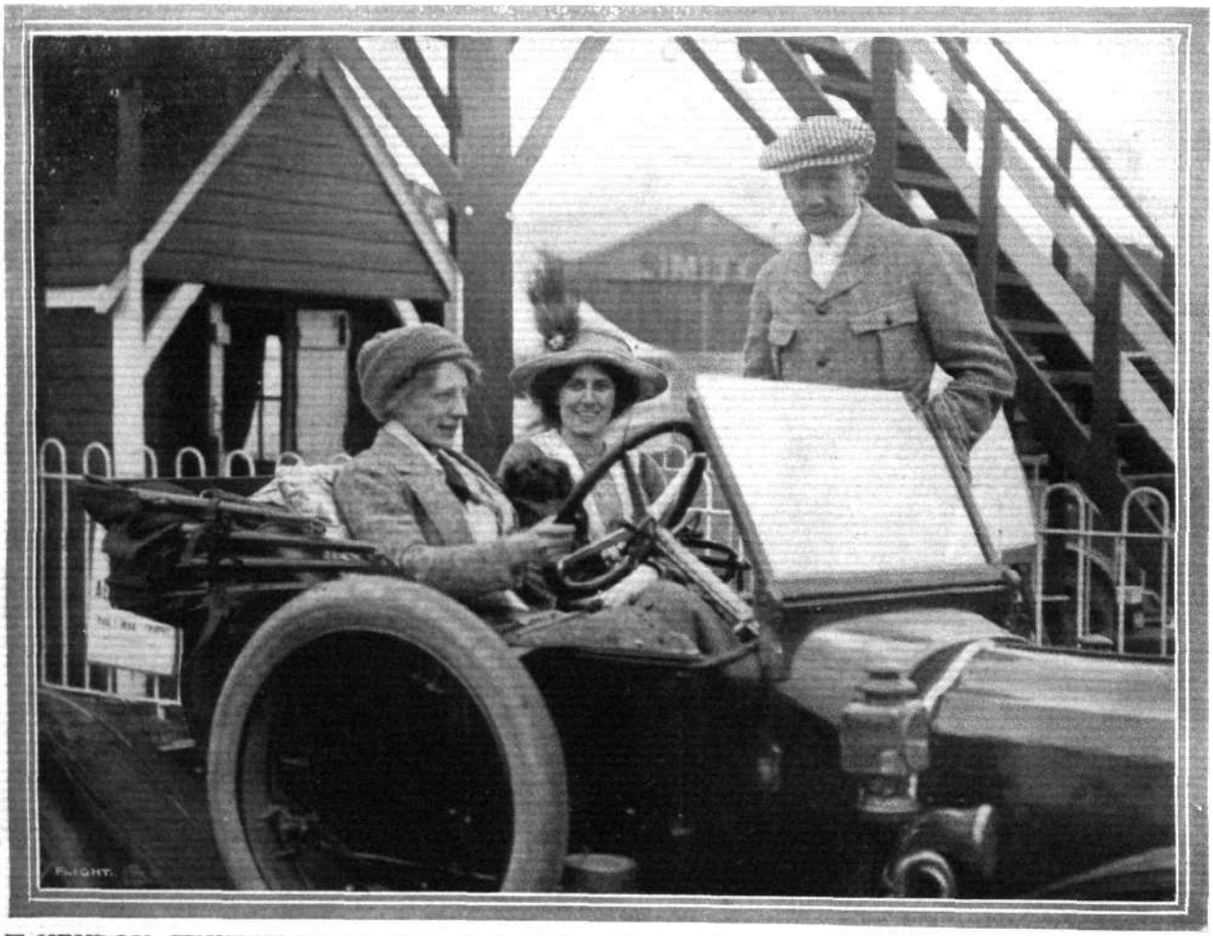
On Whit Monday the wind had increased considerably, so that in the morning only a few exhibition flights were given. The afternoon still remained so unpleasant for air work that the first event—the relay race—was declared void, as only one pair were able to finish—Valentine and Ewen, who completed the course in 10 mins. 35 secs. This race was to be competed for in pairs, biplane and monoplane. The latter of each pair was to fly two laps from a standing start and land in the "get away"; the pilot then had to obtain a dispatch from the judge's enclosure, after which he got into the awaiting biplane and finished the two laps as passenger. Turner and Hucks started first, but the latter had to come down owing to engine trouble. Hucks very narrowly escaped a nasty accident, being nearly blown down, but he just managed to save himself in time.

The next race was the speed handicap, but this was not completed owing to the nasty accident to Ewen, one of the competitors. There were three starters: Turner (Howard Wright biplane), Ewen (Caudron biplane), and Valentine (Bristol monoplane).

The machines were started against the wind and had to round pylon No. 5 before starting the circuits. Turner was first off and Ewen followed, Valentine starting nearly a lap behind Turner. Whilst Ewen was doing his last lap and just as he was coming to pylon No. 4, a side gust of wind struck him badly and tilted the machine over. Then, apparently through the wing tip striking the ground—he was flying very low—the biplane turned completely over. Ewen was thrown clean through one of the planes, head first. He received several very nasty cuts about the face, mainly owing to his goggles smashing, and he also bruised his knee. His injuries might have been far worse but for the Warren helmet he was wearing. Valentine, on seeing him fall, came down to him immediately and was one of the first to assist him. Turner also flew to the spot as soon as he saw what had happened. While Ewen was being attended to, Grahame-White made a short flight, which greatly allayed the anxiety of the spectators. Ewen was carried home on a stretcher and as he passed the enclosure he waved his hand to the crowd, eliciting from them a very hearty round of greeting.

At 5 o'clock the cross-country handicap was started. The course this time was to St. Albans and back, *twice*, a distance of about 44 miles. There were three starters: Turner (Howard Wright biplane), Valentine (Bristol monoplane), and Hucks (Blériot monoplane). Cody did not start as he was dissatisfied with the handicap given him. Turner was the first off with 23½ mins. start. Valentine next, 1½ mins. ahead of Hucks. Turner was seen returning after he had been away about half-an-hour. On reaching the aerodrome he came down, because as his engine was not pulling extra well, and owing to the bad state of the wind, he thought it advisable not to attempt the second journey. Soon after, Valentine was sighted, with Hucks high up behind him, apparently losing "air." While they were away on the second journey Grahame-White put in some passenger carrying on the "bus." Valentine was the first home as was expected, his time being 52 mins. 20 secs. Hucks took 54 mins. 9 secs.—not so very far behind. Just after 6 o'clock Sabelli brought out a new 35-h.p. Anzani-Deperdussin and carried out several short flights. Cody also gave an exhibition spin, while Turner went up twice with passengers on the "bus."

The last item on the programme—the speed handicap—was then gone through. There were five entries for this event:—Sabelli (Deperdussin), Hucks (Blériot), Turner (Howard Wright), Cody (Cody), and Valentine (Bristol). The first two started in the first heat (4 laps), Sabelli getting 1 min. 9 secs. start, and coming in first. The second heat, also of 4 laps, consisted of the last three, the handicaps being as follows:—Turner, 2 mins. 53 secs.; Cody, 1 min. 55 secs.; Valentine, scratch. The second heat went to Cody, who won by 32 secs., Turner being second.



AT HENDON, WHIT-SUNDAY.—Mrs. Stocks at the wheel of her car watching the flying. Mr. B. C. Hucks is standing.

Mr. S. F. Cody just after arrival at the Hendon Whitsun Meeting on his biplane, with fingers numbed with cold. Mr. Grahame-White is just explaining he also suffers from cold hands, but, needless to add, both know nothing about "cold feet." On the right, Mr. Cody in the seat of his machine just before starting a flight.

In the final (6 laps), Cody flew by himself, as the Deperdussin did not start. There was again a little dissatisfaction as regards the handicaps. After the race, Cody took Grahame-White up in the "Grasshopper" for a few circuits. Prensiell then went up on his 35-h.p. Anzani-Blériot and Hubert took the old Farman in hand but could not get her to lift. Turner was also up with a passenger. It was then about 8 o'clock, and as Prensiell was passing No. 3 pylon, he suddenly dived from about 50 ft. The chassis struck the ground sideways, swinging the machine completely round, smashing the whole of the under part of the machine to matchwood and hurling the engine fully four feet ahead. Prensiell was helped out of the fuselage and it was found that he had fractured his right leg, so he was removed home in a car. Examination of the machine showed that, as far as could be seen, the warping and rudder control seemed to be in good condition.

This brought a rather eventful meeting to a close, and our readers with ourselves will wish most heartily both Mr. Ewen and Mr. Prensiell a speedy recovery.

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RECENT AIRSHIP WORK AT FARNBOROUGH.

DURING the past two months a great deal of flying has been carried out at Farnborough with both "Beta" and "Gamma."

The feature of the work has been the greatly increased use made of "Gamma" and the improvement in handling her both in the air and on the ground. A large number of alterations have been carried out since the ripping experiment last autumn. The main framework appears to be entirely new, and apparently is of much greater section and strength than before.

A pair of wooden skids have been placed under the engines and compartments for the crew, thus raising the floor some two feet off the ground. This has enabled the designers to place the propeller shafts lower and to fix the engines in the centre of the frame instead of on the top as formerly was the case. The only projections now above the framework are the radiator and the heads of the crew. The engines, which can be clearly seen inside the framework from outside, are of the four-cylinder horizontally-opposed type, and each drives one propeller; and there is, apparently, no coupling between them; at any rate some weeks ago the ship landed with only one propeller revolving.

The rudder is now balanced, instead of the rather large unbalanced one in use before.

The whole of the frame from the engine to the stern is cased in with fabric, and this appears to have had a remarkable steadying effect on the flight of the ship; pitching and rolling is far less noticeable than it used to be, even in gusty weather.

On several of the earlier trips this year it was remarked that the ship sometimes landed with the envelope extremely empty and flabby; this would point to either defective valves or to a lack of power in the fan driving the air into the ballonets. Whatever it was the fault appears now to have been remedied. A very fine flight was carried out last week on Wednesday. A very gusty wind was blowing on the ground from the west averaging probably 18 miles per hour, with gusts up to 25 miles or more; higher up the clouds indicated that a small gale was blowing. "Gamma" was taken out of the shed into the Royal Aircraft Factory enclosure, a grass covered space about 150 yards by 100 yards, with buildings some 90 ft. high on the west, 70 ft. high on the east, 40 ft. trees on the north, and a spiky railing on the south. The ship ascended from this confined space about 7 p.m. with a crew of four on board; Lieut. Waterlow, pilot in charge, Capt. Maitland steering, a N.C.O. mechanic in charge of the engines, and Capt. Lefroy (of the Wireless Company, R.E.) handling the wireless apparatus. A flight of about twenty minutes was made, of which two minutes was occupied by the return journey with the wind. During the flight the stability and steadiness of the ship was most remarkable, an excellent straight course was maintained and a uniform elevation which appeared to be something under 500 feet.

Mr. de Havilland made a remarkable flight in the factory machine about this time, and the behaviour of the two craft was in great contrast, the big one so steady and the little one so buffeted by the wind. The aeroplane made a faultless and thrilling landing on the open common, the airship landed successfully in the confined space of the factory enclosure, where it was subjected to a variety of eddies and cross winds coming round the high buildings until right down on the ground. Between 20 and 30 men sufficed for the landing operations, which were witnessed by a large crowd.

A night trip was to have been carried out last week, but the heavy wind and continual rain made it out of the question. It is getting quite common now to see the airship out flying while all the aeroplane sheds are fast closed. Further mooring trials at the mast have been carried out with "Beta," apparently with success.

Lieut. Usborne, R.N., who was associated with the Naval airship at Barrow last year, is down here, and has been up as a passenger in both "Beta" and "Gamma."

Altogether airship work is looking up considerably and very practical results should be anticipated at the manœuvres next autumn.

PTERODACTYL.

WILBUR WRIGHT, 1867–1912.

WORDS cannot express the loss that the world of aviation suffers in the decease, on May 30th, of Wilbur Wright, the greatest of all inventors of the flying machine and the first of all pilots. Although hardly unexpected during the past few days by reason of the nature of the illness, nevertheless the sad event has been all too sudden, for while there was life there was hope, as foreshadowed last week in our pages, but, as now known, doomed to disappointment.

Wilbur Wright was born in 1867, at Dayton, in Ohio, and his father, a broad-minded bishop, was the first to encourage the inventive and mechanical genius of his two sons. Their first serious engineering achievement was the building of a printing machine, but subsequently they transferred their attentions to bicycle making, for they possessed in a marked degree the American trait of making a useful and up-to-date occupation out of their hobby and conducting it on quite serious lines.

When, in 1896, Lilienthal met his untimely end, Wilbur Wright was inspired by the brief notice of the catastrophe that appeared in the Press to take a momentary and somewhat passive interest in the subject that Lilienthal had made his own especial study. He took down from the shelf of his library Marey's classic work on "Animal Mechanism," which he had already read several times as a boy. From this somewhat casual act, the momentary interest in the occasion received a new lease of life, and the passive concern in the subject with which it was associated served as the incubator of a vitally active germ. More modern works relating to aeronautics were read, and his brother Orville, being equally interested with himself, they decided together to try and follow in Lilienthal's footsteps.

It seemed to Wilbur Wright that the main reason why the problem of flight had remained so long unsolved was that no one had been able to attain any adequate practice. Lilienthal himself, who, of all experimenters, alone could be said to have had any practice in the air at all, had only spent an aggregate of about five hours in the air, made up of flights lasting a few seconds each in duration, according to Wilbur Wright's reckoning.

Having made up their minds to take up the subject, they attacked the problem in a characteristically practical way, immediately proceeding to build a glider of some two hundred square feet area, which they calculated would be capable of support in the air at about eighteen miles an hour. Initially their idea was to fly this machine as a kite on the side of a hill, with a pilot on board, so that experience in riding the air might be obtained without actual motion over the ground.

They built their first machine in 1900, but lack of suitable material caused them to cut down the area to 165 sq. ft. It was a biplane constructed on the trussed bridge principle employed by Octave Chanute, who had been responsible for the introduction of gliding in America and who later on took a personal interest in the Wrights' experiments. From the first, the Wright glider showed unmistakeable evidence of keen practical originality. It was designed so that the pilot should lie prone on the lower deck, which would decrease head resistance and eliminate pendulum action arising from the underhung body assumed by Lilienthal. Instead of balancing the machine by an acrobatic displacement of the pilot's position, as was Lilienthal's custom, the Wrights fitted their glider with a simple contrivance for warping the wings so that equilibrium might be maintained by differential dynamic reaction. There was an interesting point, too, in the trussing of the machine, whereby all the tie wires could be tightened simultaneously merely by shortening two of them. These, and many other features, showed conclusively that Wilbur Wright had brought into the field of aviation a wonderfully clear thinking and active brain. He realised the necessity of practical experiments as the sole reliable foundation of progress, but he knew also the essential importance of understanding his subject as far as possible before he began the labour of practical work in the field.

Their first trials with the 1900 machine took place at Kitty Hawk, in North Carolina, and, in general, the results were satisfactory, although the supporting velocity and angle of incidence were both considerably greater than had been estimated. Tests of lift and drift also led them to suppose that they might have made the camber of their planes too small. These earlier experiences included flying the glider as a kite with the pilot on board, and also several free flights down the side of a hill called the Kill Devil sand hill, which has a 10° slope.

In 1901 they completed a larger glider, having an area of 308 sq. ft., with the camber increased from one-twenty-second to one-twelfth the chord. The results, at first, were unsatisfactory, the machine exhibiting considerable unsteadiness in the air. It was their first investigation into the causes of this defect that led them conclusively to establish the retrograde movement of the centre of pressure at very small angles of incidence, and thereby to erect for all time a kind of danger sign, as it were, to warn the constructors of future machines.

As the result of their experience in 1901, Wilbur Wright formulated the following conclusions, which he subsequently published :—

"1. That the lifting power of a large machine held stationary in a wind a small distance from the earth is much less than the Lilienthal table and our own experiments would lead us to expect. When the machine is moved through the air as in gliding, the discrepancy seems much less marked.

"2. That the ratio of drift to lift in well-shaped surfaces is less at angles of incidence of 5° to 12° than at an angle of 3°.

"3. That in arched surfaces the centre of pressure at 90° is near the centre of the surface, but moves slowly forwards as the angle becomes less until a critical angle, varying with the shape and depth of the curve, is reached, after which it moves rapidly towards the rear till the angle of no lift is found.

"4 That with similar conditions large surfaces may be controlled with not much greater difficulty than small ones if the control is effected by manipulation of the surfaces themselves rather than by a movement of the body of the operator.

"5. That the head-resistances of the framing can be brought to a point much below that usually estimated as necessary.

"6. That tails, both vertical and horizontal, may with safety be eliminated in gliding and other flying experiments.

"7. That a horizontal position of the operator's body may be assumed without excessive danger, and thus the head-resistance reduced to about one-fifth of the upright position.

"8. That a pair of superposed or tandem surfaces has less lift in proportion to drift than either surface separately, even after making allowance for weight and head-resistance of the connections."

In the interim, between the experiments of 1901 and those of 1902, the Wrights conducted laboratory experiments, the results of which have not yet been made public. Their 1902 glider was again a biplane, having an area of 305 sq. ft., a span of 32 ft., and a chord of 5 ft. There was an elevator in front, and two vertical tail planes at the rear. At a later period, a single rudder of half the area was substituted for the fixed tail planes. This model also had straight spars in the main wings, whereas those built previously had had them arched like gulls' wings. No complete record was made of all the glides, but as many as 1,000 may have been made during the season. The longest glide lasted 26 secs., and covered 622½ ft.

Having brought their gliding experiments to a pitch of perfection that satisfied them, they decided to take the momentous step of building an engine-driven machine. Not being able to find an engine suited to their requirements, they proceeded therefore to make one for themselves, a four-cylinder four-cycle petrol motor designed on simple but in some respects original lines. Their

machine was fitted with two chain-driven wooden propellers revolving in opposite directions.

On the 17th December, 1903, they succeeded in making four free flights from level ground against the wind, and the first announcement in England of their success appeared in the *Auto.* of December 26th, 1903. In 1904 many more successful flights were made, and in 1905 they improved the control of their machine, and generally produced a model that they were satisfied they could introduce to the public.

Never courting newspaper notoriety, and reserved of manner except to his intimate friends, Wilbur Wright was not disposed to advertise either himself or his work, and the general public consequently knew little of what had been accomplished, and was inclined to regard many of the statements made on the subject with the scepticism appropriate to rumour. This doubt was enhanced, moreover, by the fact that a long period ensued, during which nothing was heard of Wilbur Wright and his brother beyond an occasional mention that they were in negotiation with various authorities for the sale of their patent rights.

When Henry Farman won the first Grand Prix *three years later*, by flying a circular kilometre, the world perforce hailed it as the greatest thing that had yet been done, because so far as the world at large was concerned, that was the first circular flight that mankind had "officially" observed. Three years previously, Wilbur Wright had already flown distances exceeding *twenty miles* in length, and when in 1908, he also went to France and showed what he could do with the machine that had for so long been idle in its crate, the world at last no longer doubted his attainments in the past.

In the history of aviation there has been no greater man than Wilbur Wright. Endowed with great physical energy and keen mental activity, his qualities as a practical investigator were rendered ideal by a temperamental reserve and caution that enabled him to minimise the very real danger of his work without once sacrificing the scientific issue to the dictates of personal safety. He worked equally well with his brain and with his hands; he left nothing to chance, and down to the minutest details he saw to everything himself. Night after night he would sleep in his aeroplane shed so that he might be personally responsible for everything that was done from the earliest to the latest hours of his long working day.

To have achieved such an epoch making accomplishment as learning to fly, in a remote spot far away from observation, and without the usual accompaniment of the Press, may, according to modern ideas, have been somewhat of an anti-climax, but the merit of the result remains. Moreover, Wilbur Wright had never withheld the results of his work from his fellow men, and those who talked so much of the secrecy and mystery of the Wrights ignored the fact that Wilbur Wright adopted the accepted practice of scientists by reading two papers before the Western Society of American Engineers. These papers, the second of which was read in 1903, were seemingly forgotten by many students of aviation ere the first officially-recorded flight took place in France.

Notwithstanding the veil that leaves his first conquest dim in the public eye, however, Wilbur Wright nevertheless began to fly in France at the psychological moment. By his achievements there, he gave to others working in his own field the greatest gift of all—confidence in their own ability to succeed. Of all stories of mundane progress, there is none perhaps quite so fascinating or romantic as that which tells of Wilbur Wright's first flying days in France. There you have an incredulous public watching with ever changing mien the steady but none the less graduated unfolding of his art by a past master. Wilbur Wright, with his characteristic caution flew first a little and then a little more; he cared nothing for the spectators, and thought neither of startling them nor of mystifying them. Seeing the flights of a beginner executed with the precision of an expert, the crowd knew not what to believe; they could only wait and watch. And so, in full view before the eyes of the world, did Wilbur Wright re-conquer the air—and who shall say that this belated, but still spontaneous recognition of his triumph did not, after all, accomplish most in the long run for the future of flying.

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The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Balloon Race at Hurlingham.

THE Point-to-Point Race for the cup presented by Mr. John Dunville, will take place at the Hurlingham Club, Fulham, S.W., on Wednesday, June 12th, 1912. Members desiring to compete are requested to advise the secretary not later than 12 o'clock noon on Saturday, June 8th, 1912. Entrance fee 10*s*.

The rules governing the competition can be obtained from the secretary.

Members of the Royal Aero Club will be admitted to the Hurlingham Club free, on presentation of their Royal Aero Club membership cards.

Ascent in the Club Balloon.

The Club Balloon will make a private ascent from Hurlingham on Saturday, June 8th. Members wishing to make an ascent are requested to send in their names to the Secretary together with a remittance for £4 4*s*. Seats in the Balloon will be allotted according to priority of application.

Presentation to Library.

Messrs. Claude Grahame-White and Harry Harper have very kindly presented to the Library a copy of their book "The Aeroplane in War."

166, Piccadilly. HAROLD E. PERRIN, Secretary.

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

OFFICIAL NOTICES AS SUPPLIED BY THE SECRETARY.

Meetings.—*Mr. Holt Thomas's lecture will be held, by kind permission, in the Committee Room of the Royal Automobile Club instead of at the Royal United Service Institution as previously announced.*

June 12th, Wednesday, 8.30 p.m. G. Holt Thomas on "Hydro-aeroplanes," illustrated by cinematograph.

Members are requested to note that under the rules they are permitted to introduce visitors at general meetings.

Informal Meetings.—Informal meetings for the discussion of set subjects are held at the Society's Offices, 11, Adam Street, Adelphi, on Mondays from 5 p.m. June 3rd, "The Handicapping of Aeroplanes."

Election of Student.—The following has been elected a Student of this Society: F. E. Nancarrow.

Society's History.—An illustrated history of the Society has been prepared and is being circulated to all members. The Council hope that members will assist them in their efforts to increase the membership and funds of the Society by purchasing copies for distribution, or by forwarding donations to the Secretary to defray the cost of the effective circulation of copies.

T. O'B. HUBBARD, Secretary.

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A Strike of Aviators.

SOME little excitement was caused in German Aviation circles by the announcement that in the middle of the Johannisthal flying week the pilots intended to strike unless the employers promised to pay a minimum wage of £15 a month. It was stated that some pilots are only paid half this sum.

Hydro-Aeroplanes for Liege.

THE continental towns are recognising the value of hydro-aeroplane displays, and aviators who have amphibious machines are not likely to want for engagements. Liege announces a competition for June 26th and 27th, at which it is hoped Paulhan and Barra will be present, as well as a couple of Belgian exponents of the art.

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

BROOKLANDS.—On Wednesday morning of last week, Lieut. Parke was out with some of the Avro pupils, while at the Sopwith school Raynham was giving lessons to Hedley, Powell, and Alston, until flying was stopped by the rain. Messrs. Dawes and Harrison did some rolling on the Deperdussin, and the Pashleys put in some straights on the Humber. In the evening the Howard Wright and Bristol machines were the only ones out with Raynham and Hotchkiss in charge respectively, instructing the pupils in straight flights and landings. Dawes and Fox were practising on the Deperdussin taxi on Thursday morning, and Raynham had Capts. Howell and Alston, as well as Messrs. Powell and Hedley on the Howard Wright, but had the misfortune to drop a cylinder at the far end of the ground. He resumed school work about noon on the Burgess-Wright machine, but after about half-an-hour the wind put an end to the proceedings. On Friday morning the Avro was in charge of one of the pupils for a straight flight, in spite of a strong breeze. Lieut. Parke started on Saturday morning for Hendon on the enclosed Avro monoplane, but although he got away in good style his engine gave trouble just before Weybridge, and he made an 800-ft. glide into a field alongside the canal. Unfortunately a wire fence which crossed the field was not noticed by Lieut. Parke, and the machine gathered it up before turning over. Thanks to his helmet, Lieut. Parke was unhurt, and managed to squeeze through the trapdoor in the roof. The machine suffered very little beyond a smashed propeller, and in half an hour it had been dismantled and returned to the sheds. Kemp made a good flight on the Ducrocq racing Farman, it being his first appearance on a double-decker for some months. The Vickers was flying several circuits, piloted by Capt. Wood and Macdonald alternately. Parke was out again in the afternoon on the Avro doing some very successful *remous* hunting. In the evening a get-off competition was held, resulting in an excellent finish, both Sopwith and Raynham using Blondeau's Farman in the first two rounds and in the final Raynham won by one-fifth of a second. A long morning's tuition was put in at the Avro school on Sunday, and a new pupil, Mr. "Charlton," at once progressed to the skimming stage. Macdonald was out on the Vickers monoplane and did several circuits in fine style, flying well outside the Aerodrome. A landing competition was held in the afternoon, which resulted in a win for Sopwith on his Blériot monoplane, who landed 2 ft. from the post, with Raynham on the Farman biplane, second, and E. Hotchkiss on Mr. Morison's Bristol monoplane, third. This was followed by a relay race, which was won by Sopwith and Spencer, Moorhouse and Hotchkiss taking second place. On Monday morning, Macdonald had the Vickers monoplane out while the Avro biplane was also doing hops in charge of a pupil. At the Bristol school, Hotchkiss was instructing pupils and Gordon Bell was trying one of the Bristol monoplanes. Before the race to Chertsey and back Moorhouse and Parke were testing the weather and found it very bumpy. In the race two competitors suffered disqualification for not rounding the pylon at the paddock end of the ground, Hotchkiss in the first heat and Moorhouse in the final. In the first heat Macdonald was first, Moorhouse second, Hotchkiss third, and Spencer fourth, while Lieut. Porte was brought down at Chertsey by engine trouble. In the second heat Raynham on the Burgess-Wright machine was first, Pizey on the Bristol biplane second, and Sopwith on the Blériot third. The final was won by Raynham with Pizey second and Macdonald third. The full results were as follows :—

Result of Final.

Pilot.	Machine.	Motor.	Start. m.	s.
1. F. Raynham	Burgess-Wright B.	40-h.p. A.B.C. ...	6	24
2. C. P. Pizey ...	Bristol B. ...	50-h.p. Gnome ...	10	27
3. L. Macdonald	Vickers M. ...	50–60-h.p. Vickers	3	24
4. H. Spencer ...	Spencer B. ...	50-h.p. Gnome ...	10	30
5. T. Sopwith ...	Blériot M.... ...	70-h.p. Gnome ...	1	12
6. W. Moorhouse	Blériot M... ...	30-h.p. Gnome ...	2	36
7. Gordon Bell	Blériot M.... ...	50-h.p. Gnome ...	2	36

After the racing, a good deal of school work was done until dark. Mr. "Charlton" on the Avro was doing some good "hops," while Arthur on the Bristol monoplane was flying for 20 minutes in excellent form. Raynham on the Farman took round Capts. Alston and Howell, and Sopwith gave trips to several passengers on the Blériot. A great amount of teaching was put in on Tuesday at the Sopwith, Avro, and Bristol schools. Hotchkiss gave landing practice to Becke and Holyoake, both of whom later did some rolling. Arthur, on the monoplane, was brought down by a failing engine on the rough ground by the track, breaking the propeller and front skid. Raynham, on the Farman, took round Herbert and Hedley, the latter flying the machine from the pilot's seat. Capt. Becke, although he had only been at the Bristol school a few days, and had never been off the ground before, cleverly got his machine out of a difficulty. A monoplane landed in front of him, and in order to avoid a collision he got the machine off the ground, and made a big jump, and landed safely on the other side of the monoplane.

Brighton-Shoreham Aerodrome.

MR. NEWTON-SMITH was out in the Collyer-England on Saturday and did some pretty flights on this excellent machine, but in landing buckled a wheel. Mr. Yates went up in his Blériot monoplane but his engine missed badly and his flight was short. Next day the breeze was too strong until late evening when Mr. Yates, on his monoplane, made several circuits ; and Mr. Newton-Smith was also out in the Collyer-England. Monday was too windy for aeroplane flying in afternoon, so the Club glider was brought out and afforded very great amusement before a large crowd, taking several passengers for trips. Towards the evening Mr. Newton-Smith was out on the Collyer-England doing half circles. Mr. Yates put up one or two good flights.

Filey School (Blackburn Aeroplane Co.)

BRERETON on Sunday was giving exhibition flights ; he put in some very fine flights during the latter part of the afternoon, and did some excellent *vol planés* with engine shut off. He then made several trips with passengers, which now is becoming quite popular amongst the visitors at Filey. All the flights were made on the Isaacson-engined machine, which is running remarkably well ; moreover, it climbs splendidly with passengers, owing to the great power it develops, although it is only rated 50-h.p. Exhibition and passenger flights were given Monday and Tuesday, during which time the pupils were not practising, owing to possible danger presented by the large crowds.

Freshfield (Mersey Aeroplane Co.)

OWING to the mist there was no flying at Freshfield until Saturday night, when both Mr. Fenwick and Mr. Higginbotham were out on their machines, carrying passengers, during one of which a little speed competition was indulged in, Mr. Fenwick's monoplane proving faster than Mr. Higginbotham's biplane.

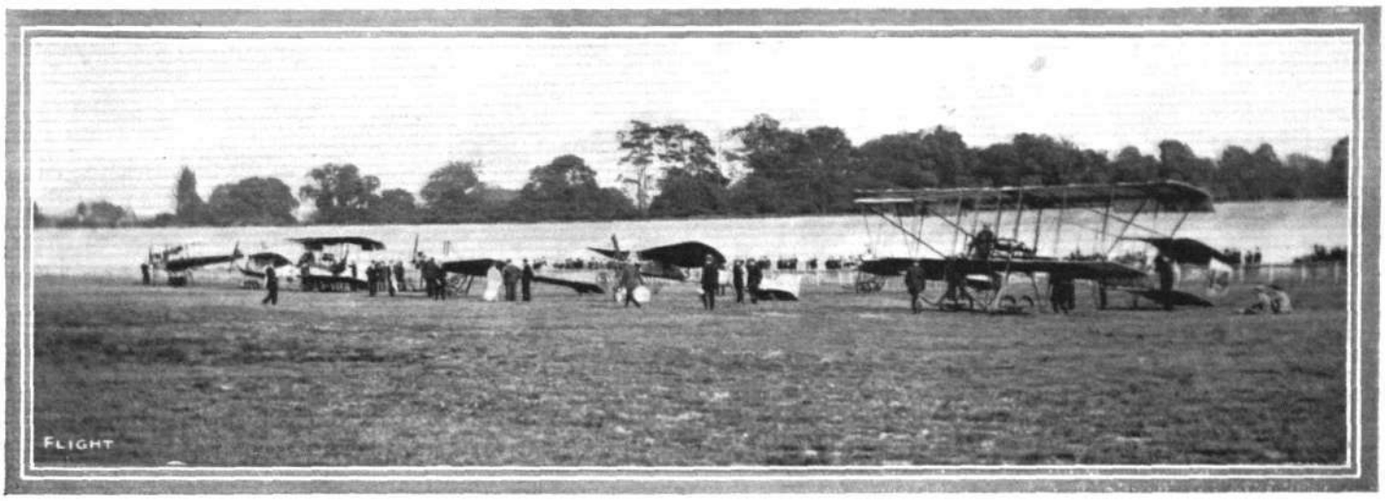
London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Monday, last week, school were at work before 4 a.m., Lieut. James making many straight flights on Biplane No. 3 and Mr. Hubbard flying circuits ; Mr. Lewis Turner also at work testing Biplane No. 10, after various adjustments had been carried out and found machine flying much better.

Another full day's work was put in on Tuesday, from daybreak until dusk. Biplane No. 3 piloted in turn by Lieut. James, Major Liles and Mr. Kershaw doing straights, and Mr. Hubbard, Comm. Yeats-Brown, and Mr. Roupell flying circuits. Biplane No. 1 also in the field, and after being tested by Mr. Lewis Turner, Comm. Yeats-Brown, Messrs. Gates and Kershaw and Lieut. James were all busy at straight flights and circuits. Mr. Lewis Turner was giving passenger flights to two new pupils, viz., Captain Salmond and Mr. Meredith Wynne on Biplane No. 10 ; and Captain Nicholas was flying straights on Monoplane No. 4, and Captain Salmond having his first lesson in rolling on the same machine. In the afternoon, Mrs. Stocks, Capt. Nicholas and Mr. Biard at straight flights and Capt. Salmond rolling on Monoplane No. 4. Messrs. Manton, Roupell, Comm. Yeats-Brown and Major Liles at circuits and Lieut. James at circuits and figures of eight on Biplane No. 3 ; Mr. Grahame-White also up on same machine with a new pupil, Lieut. Rathborne, as passenger, and afterwards with Master Guy Lewin (Winkle) in the passenger seat. Mr. Lewis Turner very busy on Biplane No. 10 with his pupils giving instruction flights to Mr. Wynne and Capt. Salmond and to various passengers. Messrs. Fowler and Hubbard at circuits and right-hand turns, afterwards flying the test for their *brevet* which they completed in fine style, being observed by Mr. L. Seymour Metford and M. Marcel Desoutter.

Wind was not too favourable Thursday, and Mr. Lewis Turner, after making several flights to test the wind, decided to devote the day to instructions in the works.

Friday, Mr. Lewis Turner was at instruction flights on Biplane No. 10, afterwards taking up three new pupils in the passenger seat, viz., Lieut. Rathbone, Baroness Schenk, and Mr. Scully. Capt. Salmond rolling on Monoplane No. 4 and Capt. Nicholas at straight flights. On Biplane No. 3, Mr. Manton at circuits and Mr. Kershaw at straight flights.



THE SECOND AEROPLANE HANDICAP AT BROOKLANDS ON WHIT-MONDAY.—The competing machines lined up for the start.

Mr. Richard Gates obtained his *brevet* on Saturday, flying all the tests in splendid style on Biplane No. 10. Mr. Lewis Turner afterwards took up Messrs. Wynne and Stuart in passenger seat. Messrs. Roupell and Kershaw at circuits on Biplane No. 3, whilst Capt. Nicholas and Mrs. Stocks were flying straights on Monoplane No. 4 and Capt. Salmond rolling.

Saturday and Sunday afternoons' work is reported elsewhere.

Blériot School.—On Monday and Tuesday last week no school work was possible owing to high winds. Messrs. Aubert and Pothet on Wednesday arrived on the ground at about 4 a.m. and found that for a wonder there was no wind, so promptly took advantage of this unusual state of affairs, and M. Aubert, feeling no ill effects from his recent unpremeditated *atterrissage*, did a couple of straights, and M. Pothet, who is going for his ticket on the first favourable day, put in a very good flight across and back. The wind then rising put a stop to school work until 5 p.m., when Messrs. Aubert, Teulade and Clappen were all out practising steadily. M. Aubert did a couple of good straights in flight preparatory to some more circuits and eights. Teulade and Clappen put in three straights and one straight respectively, when school work was interrupted to enable certificate tests to be flown. By the time these were concluded darkness had fallen. Thursday no school work possible owing to wind, and next day the same. Mechanics were very busy tuning up new engine on *brevet* machine, which is now flying exceedingly well, with new fan-type 28–35 Anzani motor. The school turned up on Saturday in full force at 4.30 a.m. and at 5 o'clock M. Pothet accomplished the necessary tests for his aviator's certificate. He flew in excellent style and at an average height of about 50 feet or so, making a separate flight for altitude, during which he reached a height of about 300 feet. The tests were observed by Messrs. Prensiell and M. Desoutter. In the evening Mr. Gustav Hamel arrived at the ground at 8.20 with Miss Trehawke Davies on their new 70-h.p. Gnome-Blériot tandem two-seater and flew a few circuits of the aerodrome round the pylones before landing, which gave an excellent idea of the extraordinary speed of the machine. Their time from Eastchurch to Hendon was exactly one hour, they having started at 7.20 p.m.

Salisbury Plain.

Bristol School.—Pizey was first out on Monday last week, first of all making a trial and then ascending with Major Boyd Moss, Lieuts. Pickles and Wale for tuition trips, and also giving a flight to Mr. Gutt. Tuesday was fairly favourable, although at times the wind was rather tricky. Mr. Prendergast was the first pupil taken up, ascending with Mr. Pizey, who then took up Major Boyd Moss and Lieut. Ercole on Biplane No. 55. Mr. Pizey was later on testing a new Bristol single-seater monoplane, just received from the works at Filton, completing two circuits and then returning to the hangars. Bendall was busily engaged in giving tuition flights to Mr. Prendergast and also to Major Boyd Moss, giving both pupils useful instruction in getting off and landing. Rising wind restricted further work.

Rain and wind prevailed throughout Wednesday, but a few trips were made during the very rare calm intervals.

Thursday was certainly better; the wind, however, was still high. Pizey gave instructional flights to Messrs. Lister and Featherstone and Lieut. Percival, then made two trials of another new Bristol monoplane just recently received. Mr. Valentine made several fine flights on one of the Bristol military two-seater monoplanes. By this time the wind was blowing at fully 25 m.p.h., and further flying was abandoned. A tricky wind was still blowing Friday. The Bristol staff were out at an early hour, and all the pupils were given tuition flights, but no pupils' solo flying was allowed.

Saturday morning was ideal and very useful aero instructive work was got through. Many pupils were out solo flying, and the Bristol schools generally had a busy day, and, from the progress showed, many of the pupils should quite easily pass the certificate tests.

Pizey was out first, afterwards being busily occupied in taking pupils for tuition trips. Bendall was also out, taking up pupils. Several excellent solos were made.

Royal Flying Corps.—Despite the somewhat stormy weather on Tuesday of last week, Capt. Brooke-Popham arrived from Farnborough on Biplane "F 7," at 7 p.m. On the following day Corporal Ridd, R.E., and Staff-Sergeant Wilson were out for straight flights under the guidance of Lieut. Conner and Capt. Brooke-Popham. Ridd and Wilson were again taken up by these two officers on Thursday, subsequently doing short flights alone. On Friday, Capt. Popham and Lieut. Conner were on Biplanes "F 7" and "F 8" and also instructing Ridd and Wilson, a programme which was repeated on Saturday, when Ridd made four good flights, one being of 20 minutes' duration whilst Wilson also made four solo trials. Both should soon be ready to qualify for their *brevets*. On Sunday morning Lieut. Conner was on "F 7" and the pupils also put in some practice, whilst in the evening, Lieut. Conner took up several passengers to a good height, while both Ridd and Wilson made half a-dozen flights each. Early on Sunday morning Capt. Loraine arrived from Buckinghamshire, but lost his way quite close to the camp and had to come down. Later Lieut. Conner went out and found him and they returned in company to the hangars. Both officers were out on Monday, putting in some scouting practice, while the pupils also were doing good work. Capt. Brooke-Popham is now away on leave.

C. Lindsay-Campbell starting for his *brevet* altitude test on a Bristol biplane at Salisbury Plain.

THE DORMAN AEROPLANE ENGINE.

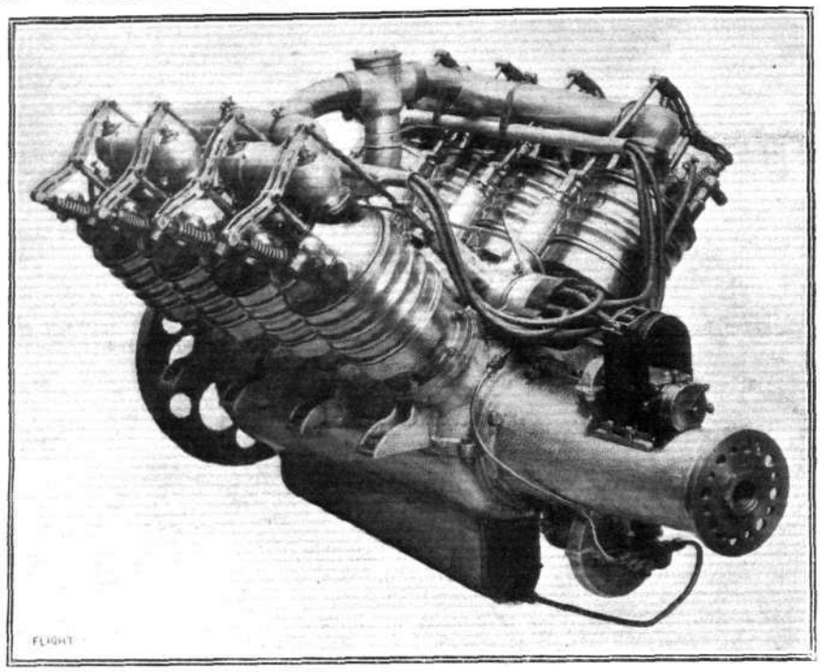
REFERENCE has already been made to the fact that Messrs. W. H. Dorman and Co., Ltd., of Stafford, have taken up the manufacture of the Adams aeroplane engine so that the accompanying illustrations and particulars should be of distinct interest to all who recognise the importance of engine development in aeroplane manufacture and are anxiously awaiting the final victory of the British-built machine.—The following is from the firm's description of the 60-80-h.p. model :—

The main object has been to overcome the usual overheating of aeroplane engines. This object has been attained by using the great pressure of air from the propeller to circulate right through the crank-case, bearings, and moving parts, and, after extracting the heat from same, to use the hot air under pressure for carburetting purposes.

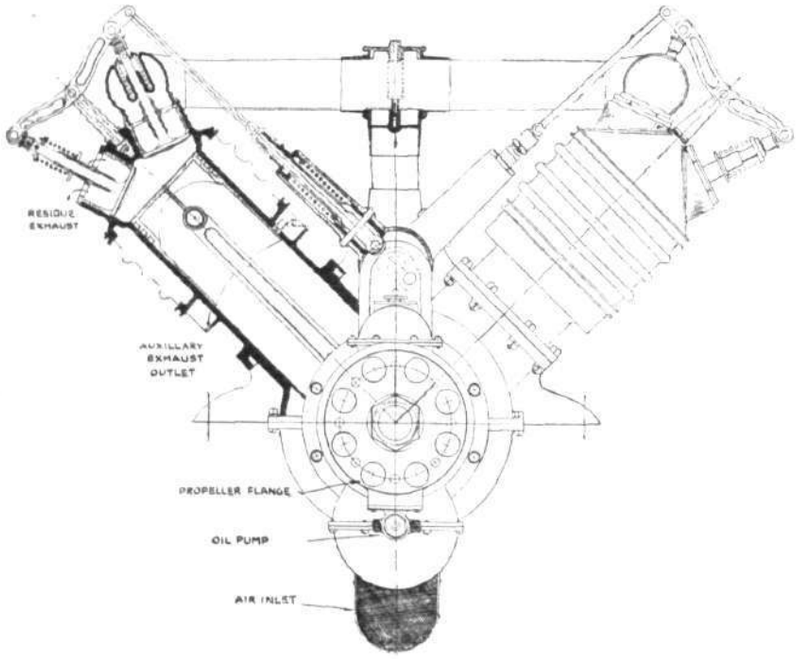
It will be noticed in the drawing that where the oil sump finishes, a bell-mouthed opening, covered with gauze, as far as possible from the centre of the propeller, receives the air, the outlet for the same being at the opposite end above the cam-shaft, and connected to the floatless carburettor, which works at any angle, or even upside down.

The engine weighs less than 4½ lbs. per h.p.

The cylinders are 4 ins. diameter by 4¾ ins. stroke, made of the very best grey, close-grained cast iron, carefully tested, after being rough bored and seasoned. They are ground to a limit gauge, and have a long turned register fitting into the crank-case to which it is fixed by a circular flange with six bolts and nuts (not studs).



The Dorman British-built aeroplane engine.



Transverse section of the Dorman British-built aeroplane engine.

The water jacket is of light gauge seamless spun copper tube, with three expansion rings pressed over the flanges top and bottom, and made water-tight by shrinking steel rings on.

Below the bottom steel ring will be seen an annular space ; this is really the auxiliary exhaust silencer, the copper jacket being turned over the bottom flange. It is therefore impossible for any flame to reach any leaky petrol which may be about and cause fire ; also, the holes do not extend more than two-thirds of the circumference of the cylinder by this method, and by making the piston longer than the stroke, the holes are never uncovered from below, so that it is impossible, as shown on the drawing, for any oil to be thrown out.

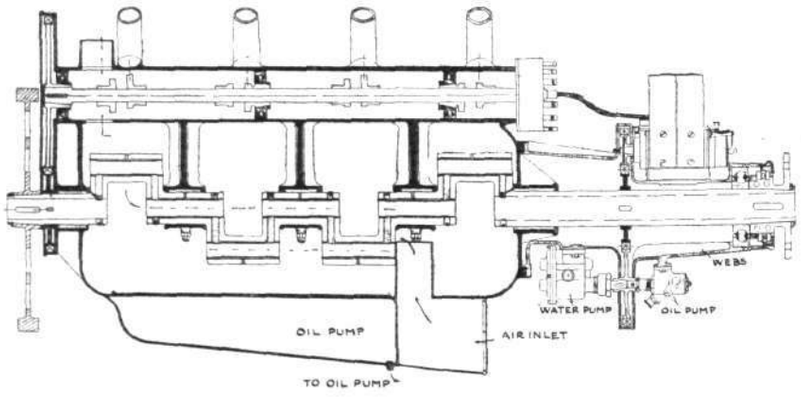
The pistons are 5 ins. long of special cast iron.

The valves are of an alloy with the correct quantity of nickel, with flat seats, $\frac{5}{16}$ in. lift, 2⅜ ins. diameter, mounted in cages at 45°. The cages are turned from Ubas steel, case hardened, the guide holes ground out, after which the flat seats are ground true. The main exhaust being below, they never after this treatment give trouble. This auxiliary exhaust is in operation at the last $\frac{5}{8}$ ins. down and $\frac{5}{8}$ ins. up of the slowest moving part of the stroke, so, that the exhaust valve opens against very slight pressure instead of about 60 lbs. to the square inch.

The valves are mechanically operated by a special single cam, which is plus and minus a circle ; therefore only eight cams are used instead of sixteen, and, being of ample surface and the hollow push rod being fitted with a roller, it is obvious that no trouble is likely to arise as long as the engine is in existence.

The cylinders are mounted in the crank-chamber at 45° to the vertical and opposite to each other. This necessitates a special form of connecting rod, and, after weighing the pros and cons of the different methods, such as not getting a straight thrust with the type which are anchored on to a master rod (for with advanced or retarded ignition and one anchored rod the tendency is to turn the bearing around the crank-shaft instead of the shaft itself), also the cost of machining and balancing forked rods being excessive, made us decide on using two light rods on alternate cylinders, which has been cheap to make and very successful.

The fly-wheel is turned from a Jessop's steel forging and is 14 ins. diameter, rim 1¼ in. wide by ¾ in. deep. The crank-shaft has five bearings and runs in white metal, and one 6 ins. ball bearing. The shaft inside



Section of the Dorman aeroplane engine base-chamber, showing internal air-cooling.

the crank case is $1\frac{5}{8}$ in. diameter, with a 1 in. hole and 2 ins. diameter, with $1\frac{3}{8}$ in. in the propeller extension. It is made of Jessop's nickel chrome steel. Light tubes $\frac{7}{8}$ in. diameter, with their ends expanded, are spun in the 1 in. holes, thus leaving an annular $\frac{1}{16}$ in. space through which the oil is pumped under pressure: the cold air passing through the tubes keeps both the oil and bearings cool.

With all monoplanes the trouble is to get the engine sufficiently far enough back to get the correct centre pressure without the propeller fouling the machine. On this engine is mounted a taper trunk extension piece 16 ins. long, in which is fixed a 6 ins. ball bearing close to the propeller; the thrust bearing, which is actually on the propeller coupling; and the magneto, which is easily dismountable and accessible, and is driven twice the engine speed, the current being transferred to a separate distributer on the end of the cam-shaft.

The engine can be fitted with extension trunk geared down to suit any requirements.

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NOTES ON THE DESIGN OF A MILITARY SCOUTING AEROPLANE.

By CAPTAIN J. A. CHAMIER, Indian Army.

AT General Henderson's lecture on this subject, on May 8th, a problem was propounded by one of the speakers in these terms:—

"Granted the premise that if it is possible with a given engine to design a single-seated machine capable of a speed of, say, 90 m.p.h., the best two-seater machine that can be made will, with the same engine, be considerably (say, 20 m.p.h.) slower: which machine do the military authorities want designers to specialise on?"

No definite answer seemed forthcoming at the time, so the following views may be of interest.

At first sight, most Service pilots will answer, "Speed for me"; but the matter requires further consideration.

Let it be supposed that an army possessing the slower machines sees one of the enemy's fast single-seaters flying overhead—it is fairly obvious that it will be impossible to prevent the speed machine getting away with such information as it may have collected. Even if the slower machine attempts to increase its natural speed by starting from a greater height and "diving," it will be a practical impossibility for it to manœuvre in such a way as to be able to damage the fast single-seater. So far the argument appears to be all in favour of speed pure and simple.

But let the position be reversed:—

A comparatively slow passenger-carrying 'plane is scouting over a force possessed of faster single-seaters: it seems at first sight that it will be unable to get away with its information. But is this really so? The pilot of the faster machine has four courses open to him.

1. He may get vertically above the slower machine and drop an explosive.
2. He may upset the latter by his draught.
3. He may sweep up alongside, and shoot the pilot or machine.
4. He may "ram" his opponent, sacrificing himself in the attempt.

Take these in detail:—

1 and 2 will be exceedingly hard to do; the slower machine is still fairly fast, and will "dodge" about. If the pilot of the two-seater dodges to the right while the single-seater is swooping to the left, the machines will be going away from one another at a speed of 150 m.p.h. Granted, however, that it can be done, the pursuing machine must come down very close indeed to make certain of its mark (this is more completely necessary in course 2), so close, indeed, that the passenger of the two-seater should have little difficulty in hitting the opposing machine with an automatic rifle or light machine gun. Vaseline on the bullets might be tried as a help to observing the direction of the shots.

As regards 3 the single pilot is quite differently placed: men who have piloted really fast machines are almost unanimous in saying that the pilot has quite sufficient to do looking after his machine—it would be they say quite impossible for him to shoot; while all the time the passenger in the pursued 'plane will be shooting at his propeller. The course suggested in 4 while suffering from the disabilities of the three foregoing has some peculiar disadvantages of its own. It is asking a great deal of the pilot of the faster 'plane to hurl himself to absolutely certain death and there is also a chance of a "miss" proving fatal to the attacker alone.

It seems from the above that for the near future at all events an aeroplane, however superior in speed it may be, has little chance of stopping the enemy's scouting machines: if this be granted surely the two-seater has many advantages over the faster single-seater 'plane. Opinions differ as to the amount a pilot alone can observe, but there can be no question that a separate observer is far better placed for this service; he can (possibly) use glasses; can, at any rate, devote his whole attention to observation; can note the results of the same, and mark the enemy's position on a map. The argument that time is so important that the commander of a force would prefer the scanty observations of a pilot, rapidly conveyed, to the fuller details of the observer on the two-seater brought back slower, has some weight indeed, but can only be vital on very rare occasions. Take a concrete instance—if the distance between the forces is very small, say, 30 miles, then only 6 mins. will be saved by the faster of the two machines mentioned above; should the distance be, say, 180 miles, the saving of, say, $\frac{3}{4}$-hour can have but little effect on movements which must extend over several days when contrasted with the far more accurate information which could be brought back by the observer on the slower machine.

It must be admitted that there is one case in which the speedier machine may score—it may be able by sheer pace to fly in winds in which the slower machine may be unable to live. It is, however, doubtful if the pilot of the fast machine in this case would bring back any observations worth having as he would be fuller occupied in managing his own 'plane.

One more point: If aeroplanes are unable to damage one another they will have to be stopped by fire from the earth, at present a very hard undertaking; no doubt this problem will be solved in time, but, when it is, it is improbable that the extra speed will render the faster machine appreciably harder to hit.

Now if it is admitted from the above that the two-seater has the balance of advantages as a scout, if we consider its peculiar advantages in other portions of the battle-field (such as transport of ammunition, incendiary or explosive bomb-carrying, the possibilities of adding armour plate, silencers, &c., even at the cost of a little added weight and lessened speed) can it be doubted that one type is the military machine of the present—viz., the two-seater.

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THE PROGRESS OF THE "DAILY MAIL" TOUR.

SCENES of enthusiasm have everywhere been the result of M. Salmet's visit to South Wales. On Wednesday of last week, he continued his tour from Bristol, and flying, after crossing the Bristol Channel, *via* Newport, he landed at Cardiff in the evening. He carried a bag of potatoes from Bristol from the market gardener who had housed the Blériot monoplane to a friend at Pontypool. During the morning and afternoon, which was spent at Newport, the machine was continuously surrounded by a crowd of people. At 3 o'clock, when the start was made for Cardiff, the weather was gusty and showery as well as very cold. On the following day several exhibition flights were made from the Sophia Gardens, Cardiff. On Friday afternoon, at a quarter to four, M. Salmet started from Cardiff for Swansea, and news that he was on his way caused an almost complete stoppage of work there, everyone turning out to see the aviator arrive. He first descended in a marsh, which from a height looked like a beautiful green field. With the aid of workmen from a near-by factory he managed to get on his way again and afterwards circled above the Bay before landing on the sands. By the time the aviator had finished demonstrations at Swansea it was too late to proceed to Llanelly, but that stage was completed on Saturday.

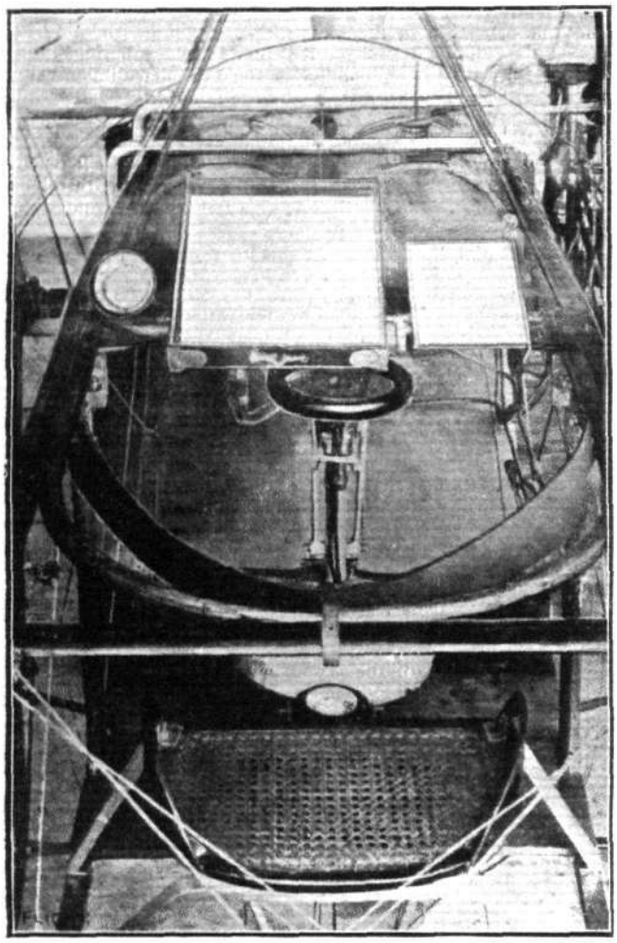
A crowd, estimated at 25,000 people, gathered to see the aviator start from Swansea, and the police had all their work cut out to keep a clear course for the machine. A similar scene of enthusiasm was seen at Llanelly, where every vantage point had its quota of gazers for the flying man. He arrived at a height of 1,500 ft. and coming down by a splendid *vol plané* landed in the cricket field arranged for his reception. On Monday, M. Salmet made two flights, in one of them steering out to sea in the direction of the Mumbles, during which he made a circular flight and also a figure eight. On Wednesday, the tour was to have been continued to Taunton, with a stop at Weston-Super-Mare.

HOW TO OPERATE A BLÉRIOT MONOPLANE.

By EARLE L. OVINGTON, BLÉRIOT PILOT.

THE following article, published in the columns of our American contemporary, *Aero*, is from the pen of one who has probably flown a greater distance over American soil in a Blériot monoplane than any other pilot. He graduated at the Blériot school at Pau, in the south of France, and amongst his successes was the winning of the £2,000 prize offered by the Boston *Globe* for the fastest cross-country flight over a course embracing three States :—

"The systems of control of almost all practical aeroplanes are essentially the same. In other words actual flying machines of the present day employ a vertical rudder to steer in the horizontal plane, one or more elevators to steer in the vertical plane and some form of manually operated lateral control device. To be sure one machine may steer by means of a cross-bar operated by the feet, while another will operate through a wheel, as in an automobile. For



View of the controls on Ovington's Blériot monoplane.

ateral stability one manufacturer prefers to use one contrivance, while another employs a different one. The fundamental principle, however, of all machines is practically the same.

"*The principal thing in operating an aeroplane of any description, is to become so acquainted with the control that the manipulation of the machine in actual flight is absolutely intuitive or instinctive on the part of the aviator.*

"Psychologists tell us that we have two minds, our objective and our subjective mind. The objective part of our mental make-up is that which is used in ordinary everyday life ; we might term it our reasoning mind. It takes time for this part of our mentality to work.

"Our subjective mind is that part of our mind which is ordinarily beyond the control of the individual. Some designate the operation of the subjective mind as intuition, while others say that it is instinctive. At any event, operations controlled by the subjective mind are usually performed without any conscious thinking on the part of the individual.

"Unquestionably the best aviators of the present day are subective flyers ; that is, they do not stop to think every time they move the control levers of their aeroplane. And the whole object of training is to so educate the student that the movement of his control levers is absolutely instinctive, requiring no conscious effort.

"I shall describe the operation of a Blériot monoplane, because it is the machine with which I have had the most experience, although at many of the meets during the past season, I have flown the Curtiss biplane. In justice to the Curtiss machine, I will say that it is the most instinctive form of control with which I am acquainted, for none of the movements of the control are at a variance with what one would naturally do under the circumstances. However, if a man can fly a ticklish monoplane, he can fly about anything with a little additional practice.

"One of our photographs shows a detail view of the cock-pit of my Blériot monoplane. This machine is driven by a 70-h.p. seven cylinder Gnome rotating motor, and is of the latest racing type. Its speed in still air is more than 70 miles per hour.

"Seated comfortably upon a little chair-like seat, fitted with a four-inch hair cushion, my feet rest upon a cross-bar to which are attached the steel wires running to the vertical rudder at the tail of the machine. If I wish to go to the left, a pressure on the left foot is all that is required, on the other hand, if I wish to turn to the right, it is only necessary for me to press the right foot. Certainly this is not very difficult.

"The lever which you see in the picture, surmounted by a small wheel, is the lever to which the wires are attached that run to the elevator immediately in front of the rudder at the tail of the machine. Wires also run from this lever to the wings so that wing-warping may be introduced to obtain lateral stability. Although there is a wheel at the top of this lever, it does not turn, but simply forms a convenient method of grasping this lever with either one hand or the other or both.

"Racing across the ground it is only necessary for me to pull the lever towards me, after the speed has increased sufficiently, for the machine to rise rapidly. Placing the lever in a vertical position the machine flies horizontally. If I wish to descend I push the lever forward, which process elevates the tail, and down I come. Neither operation is very difficult.

"The most dangerous part of controlling an aeroplane of the present day is in maintaining what is called lateral stability, that is, keeping the aeroplane on an even keel. In the Blériot this is accomplished by wing-warping. If my machine tips to the left, I push the control over to the right, which process increases the angle of incidence on the low wing and decreases the angle of incidence on the high wing, with the result that the lift on the low wing is greater than on the high wing, and there is a force introduced which tends to bring the machine back to its horizontal position. To operate the lateral control mechanism is what takes practice.

"Often, in emergency cases, all three controls must be actuated at once. For instance, assume I am flying horizontally and strike a so-called 'air-hole,' which tilts me towards the left at a dangerous angle. I do three things. First, I rush the rudder over with my right foot to increase the speed, and hence the lift of my left or lower wing. Incidentally, the speed of the right wing is lessened and its lift consequently decreased. Second, I put my lateral control lever hard over to the right. Third, I push my elevator control forward to make the machine drop. The resulting increase of speed gives my controls greater effect. In active practice, the vertical lever actuating the lateral stability and elevator devices is moved diagonally forward and to the right, thus incorporating the two movements into one.

"It is necessary for those who wish to learn to operate any aeroplane to do considerable 'grass-cutting' at first, in order that they may be thoroughly acquainted with the control of their machine and also become accustomed to rushing through space at a high velocity. It may seem easy to steer a machine on the ground, from one point to another, but until you have tried it in a monoplane, you do not realize how difficult it is. Even to an experienced operator, it is more difficult to steer a straight course on the aerodrome, when the machine is rolled along the ground than when flying. This is due to the fact that the rudder is designed for operation at a mile a minute, and not for slower speed on the ground ; hence the surface is not very great. Incidentally a machine flying in the air offers very much less resistance to turning than one wheeling along the ground.

"After one has become thoroughly acquainted with the machine, he may venture to take hops into the air.

"The principal thing about which I wish to warn embryo aviators is not to make sudden movements of their control. In order to rise, for instance, it is not necessary to pull the control towards you six or eight inches, as usually one or two inches is all that is necessary. I have seen so many students get into a machine, give the control-lever a pull towards them, and then practically stand the machine on

end in mid-air. This results in a bad tail-slide, and the machine is often reduced to toothpicks and the aviator seriously injured. Be particularly careful, therefore, to try out the various controls carefully, moving them only a short distance at a time until the desired result is accomplished.

"After the student is able to make hops and keep his machine level, he is then ready to make a more extended flight. And now I wish to give another word of warning.

"Before I ever went off the ground in any of my flights, however rushed I was, or however impatient was the audience, I always took plenty of time to tune up and examine my machine. First, I looked at my big Gnome motor. I turned it over slowly, and felt of the play of each exhaust-valve. I examined carefully the bolts which held the main supporting steel strips to the landing-chassis and the wings, in order to see that these fastenings were perfectly secure. The tension of these strips is also important, and should be practically uniform. Very often a distortion of the wings makes one of these strips tight and the other loose. There is only one thing to do, and that is to make the tension uniform before venturing into the air. Don't forget to glance at the upper supporting wires, as often a turnbuckle may become loosened; and although these wires do not support the weight when the machine is in the air, still they are of great importance.

"The leading edge of the wings should be absolutely parallel with the trailing edge. Squat down behind each wing and glance along these edges, and if they are not parallel adjust the upper or lower wires until they are. This is of the utmost importance for the machine will not be on an even keel when the control is at a central position unless the two wings are adjusted perfectly equal. Don't forget to take a look at the tail and see that the supports holding it in position are firm, and the nuts on the bolts secure.

"After you have learned actually to fly, get up in the air a good height and stay there. Remember it is not falling that injures an aviator, but the sudden stop and his contact with Mother Earth. That saved my life a good many times and I've had some side slips where I fell 500 ft. or more. I would not be here, talking to the readers of this journal if I had not been flying pretty high. Personally, I have always been of the opinion that high flying is the safest, although many aviators do not agree with me. It always made me nervous to see a man taking the sparrows off the trees or brushing the cobwebs from the chimneys of surrounding houses. I never felt right until I was up from 2,000 to 5,000 ft., and the higher I got the better I felt. Don't forget the higher you are the better chance you will have of making a safe landing, if your motor stops accidentally. When you're flying low, the chances are there is going to be a smash if your motor ceases to operate in the air.

"Speaking of the motor stopping, just remember that as soon as it ceases to operate, you must bring in the force of gravity to keep up your flying speed. In other words, point the nose of your machine down *instantly*; never mind how high you are or what you will bump into." [In view of the disclosure M. Blériot made recently, it is clear that the action of pointing the nose of the machine downwards too violently, should the engine stop, is not advisable on account of the reversal of pressure set up in the wing surfaces. We would rather it read, "point the nose of your machine down *surely but not too suddenly.*"] "You don't gain anything by keeping the machine in a horizontal plane, for it will fall anyhow, and it is much better to have it fall on the glide than to have it fall vertically. In the latter case, the use of the control is lost, and a serious accident will result.

"Be very careful in rising that you do not stall the machine. Remember that it is the rapid speed forward which supports your aeroplane, and enables your control to operate properly. Just as soon as you try to climb at too steep an angle the resistance becomes so great that your speed drops off quickly, and soon a point is reached when your controls go out of commission almost entirely. If you are near the ground you make a pancake landing, in which case, your machine must go into the hangar for a long job of repairs. I always had an inclinameter, which is simply a spirit lever, to tell at what angle I was climbing. I found by experience the angle which I could employ in order to climb the fastest, and however excited I was, or however important it was for me to climb rapidly, I never exceeded this angle. Several times I have been sorely tempted to do so, but in each case have resisted the temptation.

"Remember that in banking a monoplane on a turn, it always tends to bank too much unless an extremely short turn is made. In other words in turning to the left, for instance, a slight pressure on the left foot serves to throw you around in that direction. Immediately the speed of your left wing decreases, while the speed of your right wing increases, and the machine banks. In order to correct this and not to bank too much, you must move your vertical control to the right, or as the French term it—*cloche*, meaning bell in French, owing the bell-shaped portion at the bottom of the lever. *Banking is absolutely necessary to take a turn properly*, but be careful that you do not bank too much for the inward component of the lift of your plane will be greater than the centrifugal force and a side-slip to the inside of the circle will result.

"Speaking of side-slips, you've got to look out for them in a monoplane. A biplane does not have a tendency to side-slip anywhere near as badly as a monoplane. Let a high-speed monoplane get side-slipping badly and you're going to have your hands full in bringing it up to an even keel. The trick is—do not let it get too far over, but apply your corrective the instant the machine tilts to an undesirable angle.

"There are exceptions when an experienced aviator can disobey this rule. For instance, in taking one of the turns at Chicago, these turns were very short indeed, we had to throw the machines up to 60 or 70° bank in order to get around them in good shape. Ordinarily this would be a dangerous process, but if the aviator remembers to let his machine fall—that is point the elevator downward, while taking the turn—it is comparatively safe.

"*Never bank on a rise and never bank deeply unless you let the machine glide down.* The latter rule is not absolutely necessary, but always safe.

"A monoplane is far more sensitive than a biplane, and hence extreme care is necessary in its control, but after it is thoroughly mastered I believe that a monoplane is no more dangerous than a biplane, and is much more fun to operate. Incidentally if you're going into it from an exhibition standpoint, it is faster than a biplane and hence your chances for winning first place are greater. If I had had a biplane only to depend upon, during the past season, I probably should have lost money, rather than made it. As it was, I have no complaint to make, for in five months I made enough to keep me going for a while without serious worry as to where my next slice of bread is coming from.

"I have often been asked during the past season to what I owe my success. In the first place, I had what I consider the best machine made for my purpose of exhibition flying. In the second place, I hired two of the best mechanics that money could buy, and I gave them all the tools that they could work with, never hurrying them on an important job, however impatient my manager might be or the waiting public. *I never went out on a flight until I had carefully inspected the machine*, and I did not let curious people bother me with questions so as to distract my attention when I performed this important operation.

"I will not say that I did not take fool chances, for every aviator that does exhibit flying has got to fly when the time comes. I believe in 'playing the game' and when you don't want to play it give it up. I have never yet disappointed an audience. A man that goes into exhibition flying must go in with his eyes open and realize what he is up against. However, I always had my machine perfect before it left the ground, and I could, therefore, rely on it ninety-nine cases out of a hundred. And my reasoning must have been correct, for I made more than one hundred flights and have never broken one stick in the machine.

"*To sum up therefore, my advice to young aviators is to—first, get the best machine you can; second, give it the very best care and attention. If you are not in a position to do so yourself hire someone who can. Thirdly, carefully inspect the machine before every flight. Fourth, don't let the machine get very far from its normal position, but correct any tendency to tilt or side-slip instantly. Fifth, never come anywhere near stalling the machine in mid-air. Sixth, if the motor stops come down to your natural gliding speed instantly, and then think about where you're going to land. Don't look around for a landing place first and then try to operate your aeroplane, for by that time it may be beyond your control.*"

Earle L. Ovington

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An American Record.

ON the 25th ult., at Long Island, Lieut. Paul Beck on his Curtiss biplane, we learn by cable, beat the American duration record by flying for 4 hours 23 mins. 15 secs., and then landing only because the wind had got up, making it somewhat risky to continue in the air.

THE AERO ENGINE.

By G. H. CHALLENGER. (*Continued from page* 453.)

Temperatures.—The temperature attained by the mixture at the moment of ignition is between 1,000° C. and 1,600° C. according to circumstances, but cast iron flows from the cupola at about 1,200° C. and it is necessary for practical reasons that the cylinder walls should not exceed a comparatively low temperature. If the cylinders are too hot the efficiency is diminished by (1) the heating and expansion of the incoming charge; if too cold the efficiency is diminished by (2) loss of heat to the cylinder walls from the exploded high temperature mixture. The working temperature of the cylinder is such that some heat will be absorbed from the exploded charge by the cylinder walls, which heat must in turn be dissipated from the cylinder walls by means of a water or air-cooling system. The rate at which heat will pass from one body to another depends on their difference of temperature so that the hotter the working temperature of the cylinder walls the less the heat units that will be abstracted from the exploded charge and the greater the number of heat units dissipated to the surrounding atmosphere or water jacket, as the case may be. From this standpoint the highest cylinder temperature at which efficient lubrication can be effected will limit the power per cylinder. With water-cooling the cylinder temperature is limited to 100° C.

The greater the working temperature of the cylinder walls the greater will be the transference of heat from them to the comparatively cold incoming charge.

The exploded charge wants the cylinder walls hot, whilst the incoming charge wants them cold, the result being a compromise governed by the question of lubrication. Every individual engine has a definite temperature at which it is most efficient.

Mixture and Heat.—The incoming charge, as it impinges on the hot cylinder walls, is expanded and the total amount of mixture induced is limited by this expansion. Commencing with the same initial pressure the same amount of energy will be required to compress to the same degree, a hot weak mixture or a cold strong mixture.

So far we have dealt only with the effect on the incoming charge of the heated cylinder walls, but by far the greatest source of loss is the heating and dilution of the charge by its forced intermixing with the residue of the previous exhaust trapped in the compression space. Several attempts have been made to lessen this loss, among which are the following:—

1. Atkinson engine (Test 4) in which variable stroke is obtained by means of special link-gear. On the exhaust stroke the piston completely expels all products of combustion. From this cause amongst others the engine showed remarkable efficiency, but the upkeep of the complicated link-gear more than balanced the gain in economy.

2. Auxiliary exhaust-ports uncovered by the piston at the end of the explosion stroke, through which it is estimated that 70 per cent. of the exhaust gases escape leaving only 30 per cent. to be ejected through the usual poppet-valve. Not only is a smaller residue left in the compression space at the end of the exhaust stroke, but the temperature of the 30 per cent. in contact with the cylinder walls is

TABLE III.—*ENGINE TESTS.*

Test.	Engine.	Experimenter.	No. of Cyls.	Bore.	Stroke.	Revs. per Min.	Compression Ratio.	Piston Speed.	Indicated h.p.	Brake h.p.	Mechanical Efficiency.	Thermal Efficiency.	Waste.
1	Otto	Slaby, 1881	1	6·75in.	13·4in.	156·7	1·65	f.p.m. 349	5·04	4·4	Per cent. 87	Per ct. 16	Per cent. Jacket 51* Exhaust 33*
2	,, ...	Thurston ...	1	8·5	14	158	1·65	368	9·6	8·1	84·5	17	Jacket 53† Exhaust 30†
3	Hornsby	Hopkinson	1	10	15	240	50 lbs.	538	10·3	8·57	80	15·3	Jacket 26·8 Exhaust 57·9
4	Atkinson	— 1887 ...	1	9·5	‡6·33 5·03 11·13 12·43	—	3·75	—	5·56	4·89	88	20·6	Jacket 19·37 Exhaust 60·1
5	White and Poppe ...	Makers ...	4	80	90	1660	—	984	—	19§	—	17	Jacket 29·2 Exhaust 53·4
6	,, ...	,, ...	4	100	110	1360	—	984	—	32·5§	—	19·8	Jacket 26·8 Exhaust 53·4
7	,, ...	,, ...	4	110	130	1150	—	984	—	41·5§	—	20·7	Jacket 30·0 Exhaust 49·3
8	,, ...	,, ...	4	120	130	1150	—	984	—	51·25§	—	21·5	Jacket 29·4 Exhaust 49·1
								Ratio of Air to Petrol in Weights.	Average Fuel per i-h.p. Hour. lbs.	Mean Effective Pressure.	Compression Pressure at 1,000 r.p.m.		
9	Clement-Talbot ...	Watson ...	4	85	120	—	4·71	11 14 17	·58	85‖	86	20 25 28	80 75 72
10	,, ...	,, ...	4	85	120	—	4·35	11 14 17	·59	84‖	77	20 25 27	80 75 73
11	,, ...	,, ...	4	85	120	—	3·92	11 14 17	·625	83‖	68	19 24 26	81 76 74
									i.h.p.	b.h.p.	Mechanical Efficiency.		
12	Diesel system by Carels Frères, Ghent	Ade Clark ...	2	—	—	154	500 lbs.¶	—	201·1	164·8	80·7	39·25	Jacket 24·5 Exhaust 36·25

* Exhaust temperature 423° C. to 432° C.

† Exhaust temperature 399° C. to 430° C.

‡ Strokes given are respectively as follows: Induction, compression, explosion, exhaust.

§ The powers increase, but not in proportion, with increase of piston speed up to 1,400 f.p.m., after which the power falls off, due to attenuation of incoming charge and other reasons.

‖ Mean effective pressures given are for mixture of 11 lbs. of air to 1 lb. of petrol.

¶ Air only is compressed. Fuel, in the shape of crude oil, is injected during the first part of the working stroke and is ignited by and maintains the temperature (about 1,000° C.) and pressure of the compression during injection.

considerably reduced. The increase of power and cooler running obtained from this system is well known, as is also the considerable loss and mess of lubricating oil due to the position of the ports. Further, on account of their opening at the end of the induction stroke they cause carburation trouble during throttle regulation.

3. Long exhaust pipes have been fitted. The momentum of the gases through them when first liberated gives a powerful suck, which helps considerably in extracting the low pressure burnt gases which remain at the end of the exhaust stroke. Great benefit has been obtained on Crossley gas engines by the use of long scavenging exhaust-pipes. Long exhaust and induction-pipes caused an automobile engine to give 50 per cent. more power at very high revolution speeds. (The effect of long induction-pipes will be considered later).

Cold Charges.—It has been seen that the colder the charge, by reason of its containing a greater number of heat units, the greater the possible power developed per cylinder, because, the greater the difference in temperature, before and after ignition, the greater the pressure available to do useful work. The difference in pressure and temperature is proportional to the degree of compression and temperature before explosion, so that for the same compression and the same quantity or mass, as distinct from volume of mixture, the average temperature of the gases during the explosion stroke will be less for the cold than for the hot mixture—a very desirable state of affairs in limiting heat transference to the cylinder walls. So far we have only considered the *rate* of transference of heat from the exploded charge to the cylinder walls, and from the latter to the incoming charge, *i.e.*, the amount of heat transferred during unit time to unit surface.

Many *v.* Few Cylinders.—The smaller the surface to which a given volume of working fluid is exposed the less heat it will lose in a given time. Considering surface and volume only, one favours a few large cylinders in place of several smaller ones of equal volume, because cylinders of equal proportion increase their capacity as the cube of the diameter, whilst the area of enclosing surfaces increases as the square of the diameter.

Valves in the Head.—We have already seen one disadvantage of cutting down the number of cylinders in the case of the Nieuport engine, further disadvantages will be seen when weight and piston-speed are considered. Meanwhile, we can see the advantage of placing valves in the cylinder-head, as practised in R.E.P., Anzani and Isaacson motors, which eliminate all valve-pockets with their increase of surface in relation to the volume. In passing, it may be mentioned, that the cylinders can be worked at a much higher temperature without risk of distortion of cylinder-barrels due to uneven thickness and temperature of the walls.

The shorter the time for which a given volume of working fluid is exposed the less heat it will lose to a given surface.

When we consider that the temperature, and therefore pressure of a mixture, exploded in a closed metal vessel would rapidly fall, due to loss of its heat to the enclosing walls, the value of high piston-speed by its rapid depression of pressure, and therefore temperature, in performing useful work is at once apparent.

Piston-Speed.—Piston-speed depends on the stroke and the number of revolutions, so that the same speed might be obtained by short stroke and high revolution speed, or low revolution speed and long stroke. This is of special interest when considered in connection with loss of heat to the cylinder walls. Consider two cylinders, A and B, which are of the same diameter, but in which the stroke of A is equal to the bore, whilst the stroke of B is equal to twice the bore. If the revolution speed of A is twice that of B the piston-speeds will be the same in each case, but the power and thermal efficiency of A will be slightly greater than B.

The surfaces of cylinder head and piston of A will be exposed to the working fluid twice as often as those of B, but each exposure will be of only half the duration. As the rate of heat transference for a given difference in temperature depends on the surface exposed, multiplied by the time of exposure, the two cases will be alike.

Long and Short Strokes.—The cylinder barrel of A will be exposed to the working fluid twice as often as that of B, but each exposure will be of only half the duration. But the cylinder barrel of B has twice the surface of A so that in each case the surface exposed multiplied by the time of exposure is the same, so that at first sight the heat transference would appear to be the same; but the exterior surface of the cylinder walls of B is greater than that of A, so that heat will be dissipated to the surrounding air at a greater rate, so permitting a higher rate of heat transference between the cylinder walls and the working fluid. This results in depression of temperature during the working stroke, thus diminishing that available for useful work and an exhaust of lower temperature than A.

Actually the combustion head, or those parts of the cylinder walls which comprise the compression space, would be subjected to the maximum explosion temperature, hence the rate of heat transference would be greatest on these parts, gradually diminishing in all parts towards the end of the end of the stroke as the temperature falls with expansion. The terminal temperature of the gases on a high-speed engine will be in the neighbourhood of 750° C. Minimum loss to the cylinder walls would probably occur when the stroke is 10 to 20 per cent. greater than the bore.

Practical limitations impose that a large proportion of the heat units liberated at ignition must be lost so far as doing useful work is concerned. The higher the piston speed the greater the proportion of these lost units which will go to the exhaust and the less to the heating of cylinder walls.

This effect will be clearly seen by comparing Engine Tests 2 and 3, Table III. When it is remembered that the heat of the exhaust will be dissipated in the free atmosphere, the advantage of high piston-speeds in limiting the heating of cylinder walls is fully apparent. Unfortunately there are serious limitations to increase of piston-speed beyond a certain amount.

(*To be continued.*)

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The Upper Rhine Circuit.

ACCORDING to the official award, Hirth was the only competitor to complete the whole of the circuit in accordance with the regulations, and so he receives the Prince Henry Cup, and also the Grand Duke of Baden's Prize. For the scouting competition between Metz and Thionville, the prize of Prince William of Wiemer has been awarded to Lieut. Bahrends, and the War Minister's to Lieut. Mahnke.

A Meeting at Johannisthal.

THE meeting arranged to take place at the Johannisthal ground during the Whitsun holidays was not very successful, as the weather curtailed the flying, while the fatal accident to a passenger naturally cast a gloom over the proceedings. On the opening day, the 24th ult., only six out of the twenty-nine entrants attempted to fly. Rupp made a long trip with a passenger, as also did Abramsowitch, while the best solo flights were, Alic, 1 hr. 53 mins.; Marchall, 82 mins.; and Abramsowitch 84 mins. The other ones to fly were Stoeffler and Rosenstein. It was on Saturday that the fatal accident occurred. Fokker on his monoplane took up Lieut. von Schlichting, who was thinking of learning to fly the machine. The machine was coming down, and when about a dozen metres from the ground it was apparently struck by a gust of wind and overturned. The officer was killed by the motor falling on him, but Fokker escaped practically unhurt. Three other machines—those of Abramsowitch, Alic and Marchall—were smashed in somewhat similar mishaps during the day. Only three flights were made on Sunday by Abramsowitch, but on Monday, although it was very cold, there was a good crowd at the aerodrome, and some fine flying was seen. Abramsowitch was up for 56 mins. with a Russian princess. Eleven aviators were out at various times, the best flights being Stoeffler, 1 hr. 12 min., and Mohns, 1 hr.

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Mishap with a Parseval Airship.

NOT a little excitement was caused at Leipzig by the visit of a Parseval airship, especially when it broke from its moorings on Saturday last, and was only brought down by the use of the ripping panel. A soldier who hung on to a mooring rope was carried high in the air and dropped among the crowd, sustaining a broken leg.

"Z 2" at Work Again.

ON the 18th ult., "Z 2," after several days' rest, recommenced work at Cologne. After her cruise the airship landed somewhat suddenly, but fortunately no serious damage was done. On each day the following week the airship was out, and on the 22nd made a speed test along the Dutch frontier, and on the following day went to Bensberg. During all these trips touch was maintained by wireless telegraphy with the forts at Cologne, Metz, Strasburg and Mayence.

A Busy Time for "Victoria Louise."

TRIPS on the Zeppelin liner, "Victoria Louise," appear to be becoming increasingly popular, and on the 19th ult., she was in the air for 10 hours. Six different trips were made, an aggregate distance of 500 kilometres being covered and altogether 160 passengers were carried. On the 23rd the dirigible for the second time sailed from Frankfort to Dusseldorf. She left Frankfort at 5.20 a.m. and following the Rhine Valley, passed Mayence at 6 o'clock, Coblenz at 7.15, Bonn at 8.14, Bensberg Castle at 8.30 and landed safely at Dusseldorf at 9.20. The airship will stay about a fortnight at Dusseldorf, and then go on to Hamburg, where a new shed is being built for her.

FOREIGN AVIATION NEWS.

Medals for Lady Passengers.

WITH a view to encouraging ladies to take up aviation, M. de Ratmanoff has offered three gold medals to the Stella Club, a club for ladies interested in aeronautics in France. One medal will be awarded this year and the others in 1913 and 1914 to the member who makes the longest flight as a passenger in an aeroplane.

Bathiat Flies to Angouleme.

WISHING to keep an engagement at Bordeaux at the end of last week Bathiat decided to fly there on his Sommer monoplane. He was delayed by the heavy rains for a couple of days but started off on Sunday. With the wind behind him nearly all the way he made remarkable speed over some parts of the journey. Mourmelon was left at 5 a.m. and at 8 p.m. the pilot was obliged to stop at Angouleme, having covered a distance of 500 kiloms. He had made a long stop at Poitiers.

Aviators Assist Artillery.

FURTHER experiments are being carried out at Mailly Camp with aeroplanes working in conjunction with the artillery. Lieuts. Bordage, Varien, and Battini, on May 24th, each made flights accompanied by artillery officers, to observe the progress of the gun firing, the results being communicated to the ground by means of rockets.

French Army to Test Air Resistance.

A FURTHER addition to the laboratory equipment of the French Army is being considered. Col. Hirschauer, Inspector-General of Aeronautics, has sent a commission headed by Commandant Rainaud to Pau to consider the question of laying down an electric railway, 8 or 10 kiloms. in length, for the purpose of testing in the open air the resistance of machines delivered to the army.

Military Flying at Chalons.

IN connection with the troops in camp at Chalons for their field training Lieuts. Challes, Bousquet, Prat, and Sapper Seguin on their H. Farman biplanes, each accompanied by an observation officer, last week made several long reconnoitring flights mostly at a height of between 1,200 and 1,500 metres, Seguin on a 70-h.p. Gnome-Farman was up to 2,900 metres while Lieut. Challes took General Menestrel a member of the War Council for a trip over the Camp. On the 24th all four pilots paid a visit to Rheims military centre and after spending an hour with their comrades returned to Chalons.

A Doutre Biplane.

IN order to have their stabilising machine properly installed, the company controlling the Doutre stabiliser is now building aeroplanes, and the first—a biplane—has just been sold to the Spanish Government. It passed the prescribed tests at Madrid on the 22nd ult.

Marcel Hanriot, the youngest fully qualified pilot—not yet being 18 years old—who is now due in England, where he is likely to be flying the Hanriot Monoplane, of which he is a perfect master. His fine work has already been demonstrated in France, Switzerland, Italy, Spain, Turkey, Austria, Belgium, and S. Russia.

WIRELESS TELEGRAPHY AND AEROPLANES.—The wireless telegraphy installation on the military Savary biplane.

Buc to Verdun on a Farman.

LEAVING Buc on their Maurice Farman biplane on the 22nd ult., Lieuts. de Marnies and Nicaud successfully flew to Verdun, keeping mostly at a high altitude.

Doings at Farman School at Buc.

ON the 22nd ult. Robillot gave a long trip to his father, who is a magistrate, and 13 other pupils were out practising, as well as Maurice Farman and the two instructors Fourny and Bernard. Lieut. Vogoyeau flew over Versailles at a height of 1,100 metres, and Adjudant Hurard paid a visit to Rambouillet. Among the visitors taken up by Maurice Farman on the following day was the Baroness von Dewitz.

A Good Trial on a Borel.

FOR his first time on a Borel-Gnome monoplane, Lieut. de Vergnette flew for an hour and a-half on the 22nd at Buc. Getting up to a height of 2,000 metres, he passed over Versailles, St. Cyr, Villacoublay, and the outskirts of Paris.

From Chalons to Amiens.

LEAVING Mourmelon at 5 a.m. on the 23rd, Corporal de Marnier set off in the direction of Amiens. He came down at 7.50 a.m. at Noyon, and in landing the machine was damaged but the pilot was unhurt.

An Exposure Test.

WITH a view to demonstrating that their machines are not seriously affected by exposure to the weather, arrangements have been made at the Maurice Farman works at Buc, for a biplane to be kept out in the open in all sorts of weather, and every day, flights will be made on it by Fourny.

A.C.F. to Organise Hydro-Aeroplane Competition.

AT its last meeting the Aeronautic Committee of the Automobile Club of France gave lengthy consideration to a programme for the 1912 season, but only reached one decision, viz., to have an hydro-aeroplane competition this year.

Vedrines Out and About.

ON Monday Vedrines was at Limoux in order to give evidence before the Commission which is considering his protest against M. Bonnail's election. He returned to Paris on the following day.

A Meeting at Marseilles.

BUSSON, on his Deperdussin, and Ehrmann, on his Borel, both gave good displays at Marseilles on Monday in connection with a meeting which opened there on Sunday. Both these pilots made flights over the bay and the port.

The Hanriot School at Rheims.

SUNDAY was a busy day at the Hanriot School at Rheims and the six Italian Lieuts. under training each had lessons in the morning and evening. Perrin qualified for his certificate and two other pupils made very good flights. Sippe put in some cross-country practice and Andre Frey was testing his machine before packing it up for Marseilles. In the course of two hours Dubreil took all the pupils for an instructional flight and carried a cavalry sergeant over Betheny and Vitry.

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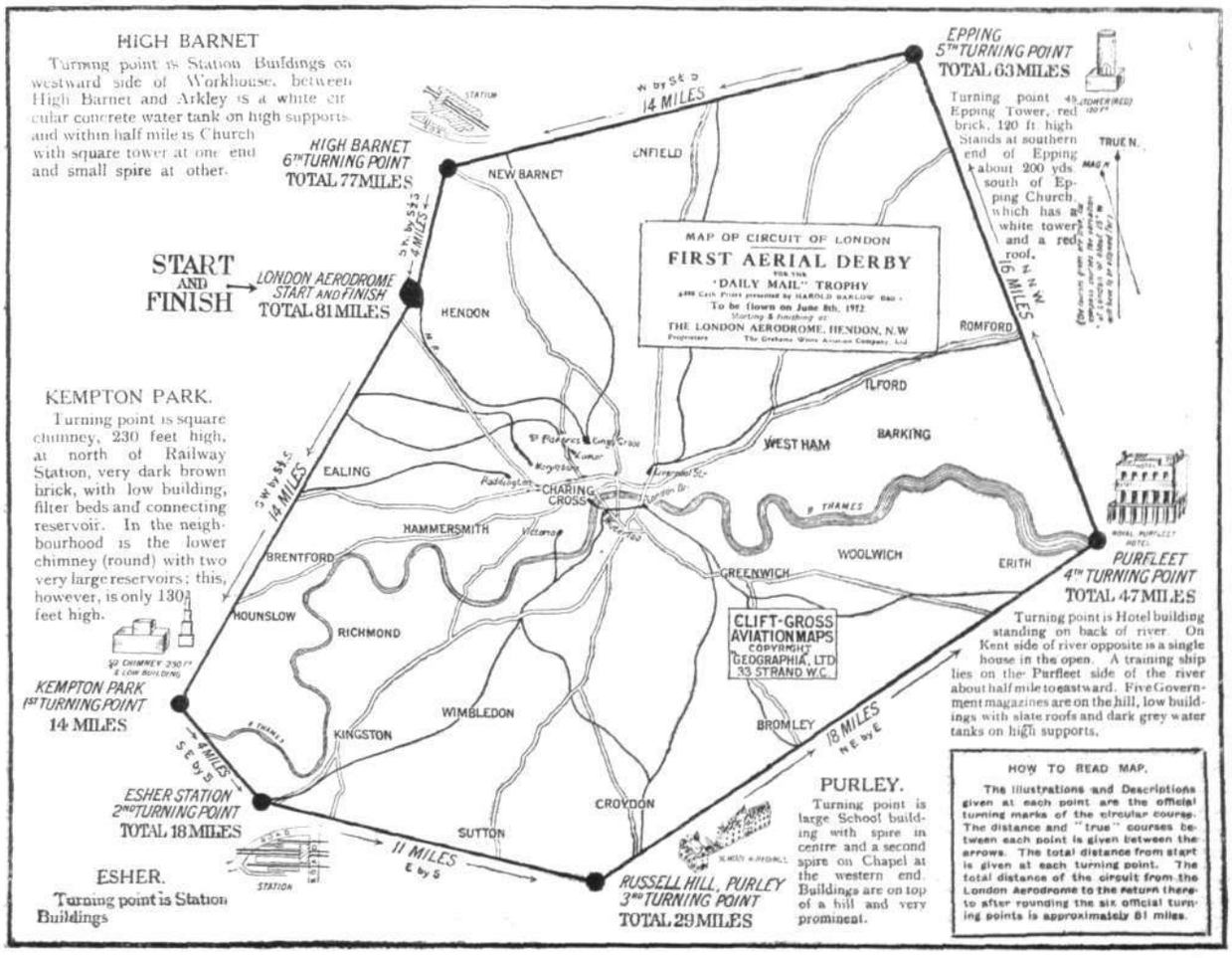
THE CIRCUIT OF LONDON—JUNE 8TH.

As promised last week, we publish below a map showing the course for this contest for the *Daily Mail* trophy and other prizes, which will be held on Saturday next, June 8th, starting and finishing at the London Aerodrome, Hendon. The start is timed for 4.15 p.m., the order of starting being decided by ballot and announced two hours before the start. Each machine must be on the starting line a quarter of an hour before it is time to start, and will be allowed three minutes to get away. The turning points must be passed at a sufficiently low and close range to enable the number to be verified by the official observer. All marks must be passed to the left. Stoppages *en route* are not prohibited.

The entrance fee is £2, and entries must be sent to the Grahame-White Aviation Co. before noon on Wednesday next the 5th inst.

Previous to this event—at 3.15 p.m.—there will be a speed handicap for prizes offered by the proprietors of Shell motor spirit.



Models

Conducted by V. E. JOHNSON, M.A.

Ornithopters.

WE must congratulate Major Baden-Powell on his presentation of a prize of £5 for a model ornithopter competition, if only for the impetus which it will give to another line of thought. There is always more than one way of doing anything, and it is only by testing different ways in a thoroughly practical, as well as a theoretical manner that the *best* one is established.

In the early days of the Aeronautical Society much attention was given to the "flapping-wing" principle, and quite a number of very interesting experiments and not a few really practical "flappers" were evolved. In the *Aeronautical Journal* for October, 1897, there is a long account of Major R. F. Moore's experiments *re* flying foxes, both natural and artificial. In his introduction he says it may be that wings are the best, as they move a larger weight of air with less velocity than a screw propeller. The slip may on this account be less. Further on he says the want of a sufficiently light motor has prevented these experiments being brought to a finality. Prior to 1893 Mr. Hargraves (of cellular kite fame) constructed models on the ornithopter principle in so far that the place of the propeller was taken by a simple pair of flapping wings which proved very nearly as efficient as his propellers. It is important to observe, however, that the flapping wing propellers of the Hargraves' models were supplementary to the main fixed aeroplane. His flapping wing propellers were first actuated by clockwork, then rubber, then compressed air, and finally steam. His earlier models are said to have flown with considerable swiftness for some yards, and though they frequently broke on falling, their behaviour while in the air enabled him to judge their merits and see the way to further improvement. One of his compressed air motors was described as a marvel of simplicity and lightness, 23⅜ ins. long and 5·5 in. diameter of aluminium plate 0·2 ins. thick; ⅜ in. by ¼ in. riveting strips were insufficient to make tight joints; it weighed 26 oz., and at 80 lb. water pressure one of the ends blew out, the fracture occurring along the bend of the flange and not along the line of rivets. The receiver which was successful apparently being a tinned iron one. Steel tube could not be obtained at that time in Sydney. This receiver served as the backbone of the machine, upon which was mounted the body frame and the propelling mechanism. A slender rod projected from the front as a safety stick (*i.e.*, protector), and was intended to bend or break, thus lightening the fall of the model as it plunges to earth at the end of the flight. The engine was said to be a marvel of simplicity and lightness, considering the date at which it was produced. Its cylinder was made like a common tin can; the cylinder covers were cut from sheet tin and pressed to shape. The piston and junk-rings were of vulcanite, and the cup-leather packing did away with the necessity of the cylinder being either round or parallel. Though the efficiency of the motor was but 29 per cent., a flight of 343 ft. is said to have been obtained. This being the best, the propulsion was, wing-flapping the time of flight, 23 secs., with 54½ double vibrations of the engine. In 1891 he set about constructing a steam motor, and such a motor was exhibited in 1893. The boiler was made of 12 ft. of ¼-in. copper tubing, in the form of a double-stranded coil, covered with asbestos cord and placed just over the backbone of the machine. It was heated by methylated spirits, drawn from a tank above, vapourised and spurted into the coils. The total weight of the flying model was 64·5 ozs., including 12¾ ozs. for the strut and body-plane and 5 ozs. of spirit and water. The power developed is stated to have been 1·69-h.p., giving a speed of 2·35 double vibrations a second. Later on—1897—he constructed a larger and more powerful plant, 33½ lbs. in weight, kerosene being the fuel.

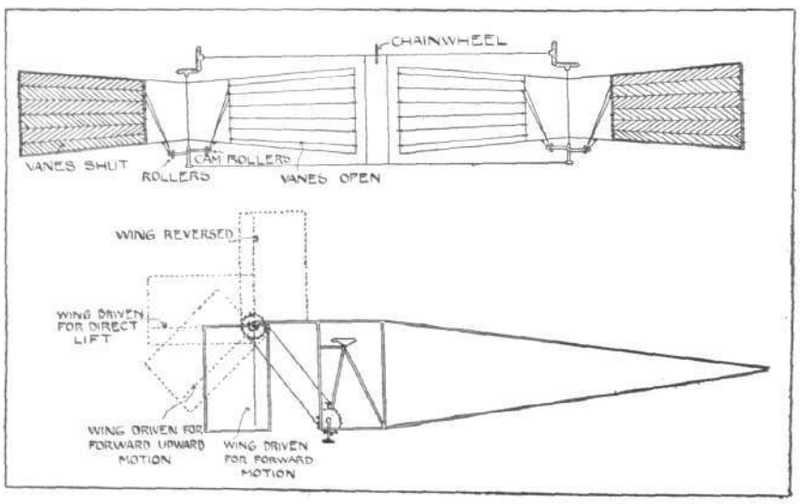
In 1904 the late Mr. Hugh Bastin designed a flapping-wing machine which, driven by a steam engine, succeeded in both lifting and propelling itself. This machine was provided with two pairs of wings, one behind the other, which were given as far as possible a motion similar to the wings of a bird.

In Hargraves' models, in which, as has been mentioned, the flapping wings were substituted for the propeller only and not for the main plane also, the wings were given an up and down motion of a peculiar character. Years previously Hargraves had read a paper before the Royal Society of New South Wales on the principles of what he called the "trochoided plane." It would be too complex to go into details of his thesis, suffice it to explain that the wings of his models were trochoided planes, inasmuch as they performed a peculiar feathering movement brought about by their method of attachment. The wing spars were pivoted to the central fore and aft boom of the machine, and they were operated by connecting-rods from a crank-shaft lying underneath. The attachment to the connecting-rod consisted of a fork and pin, by which simple device the wings always remained at right angles to the connecting-rod, thereby performing the feathering motion above mentioned.

It will be extremely interesting to see the outcome of this competition; at present we are not quite clear as to whether the prize is offered for a wing-flapping machine (like a bird) pure and simple or whether it includes as well a model supported on the principle of the aeroplane but propelled by flapping wings instead of propellers as in Hargraves' models.

Stoddart's Self-Lifting Flying Machine.

The principle on which this machine works will be understood from the following description and accompanying illustrations: The machine is fitted with two revolving wings, each having two sets of vanes, which open and shut automatically by means of rollers rotating about a cam fixed to the framework, so that for the outward half of the revolution the vanes shut and form a substantial plane, which exerts a direct thrust on the air, and for the inward half of the revolution they open, in order that as their thrust becomes ineffectual their further motion through the air—during this inward stroke—shall offer as little resistance as possible. The wings are caused to revolve by means of a chain, chain-wheels, &c., as used on a bicycle, and are contained in a framework fixed by means of a bracket on the shaft to the fuselage in such a manner as to allow the operator to swing them into such positions as are required. For instance, for a direct forward motion they are revolved in a perpendicular position, and for an upward, forward motion they are tilted out of the perpendicular to whatever angle is required. A direct lift is obtained by revolving the wings in a horizontal position.



Should the wings be directly reversed, they will at once offer resistance by beating against the direction of motion.

The machine is the outcome of seven years experimenting, during which time Mr. J. Stoddart claims to have constructed steam-driven models on this principle, which have lifted one-third more than their own weight from a position of rest.

On a large model balanced on a beam—*i.e.*, *the machine was without weight*—we have seen Mr. Stoddart's son lift his own weight by the means shown in the illustration, that is to say, drive down a volume of air with sufficient momentum to elevate that arm of the balance from which he and the machine were suspended—the machine alone being counterpoised.

Mr. Stoddart claims that this is the first time such a thing has

been accomplished; we seem to have some recollection that in the early days of the Aeronautical Society this was done by means of a balance (as here), an operator, and a horizontally rotating propeller. We have been unable, however, to spare the time to look the point up. Perhaps some old member of the Society or some member having a little spare time on his hands will look through the old journal (1870–1890, about) and settle the point.

The principle of a direct lifting and propelling paddle-wheel is receiving attention in France as well as England—with such a wheel designed by M. Alfred Pichon, some very interesting experiments have been made near St. Cyr.

Could such a machine be produced successfully it would undoubtedly be of the greatest use for military purposes—in which it will be of primary importance to be able to slow down speed at some particular moment, or even remain hovering in the air.

Whatever may be the outcome of these and other experiments of a kindred nature, the principle of the orthopter is certainly one deserving of more attention and research, especially of a practical character, than has in general been recently bestowed on it. Mr. Stoddart is now constructing a machine upon this principle, with the idea of rendering it possible for a man to fly, for he concludes: "If it is possible for a man to lift himself direct from a standstill, it is a certainty that he has more than enough power to fly with the aid of planes."

A man by tearing upstairs as hard as he can go, can, we know, exert a very considerable horse-power for a short time, but its duration, like that of some models, is an extremely short one. That man will one day be truly able to fly we fully believe, but we should personally seek its solution rather in the flight of the albatross than in that (say) of the wild duck.

The society referred to in May 18th issue as the Amberley Flying Society should have been the Polytechnic Flying Society. Also the two machines illustrated are not the same—the left hand being the "Olive," which has fitted to her the wings from the original "Weiss" monoplane, that on the right being the "Joker," which claims to be the smallest man-carrying glider in the world.

A great deal we should think in a matter of this kind depends on the size of the "man"; for instance, we know of a man—but perhaps we had not better say any more.

Model Club for Huddersfield.

G. Butler (7, New Hey Road, Marsh-Huddersfield), writes saying that a model aero club is wanted there; will those interested please communicate. He also wishes to procure a copy of No. 1 of FLIGHT and desires an explanation of the term "rolling," having read of aviators rolling in their machines but not understanding the meaning.

Replies in Brief.

G. SMITH.—Your letter *re* elevator is not clear. Send along two drawings, plan form, first as machine was originally, and secondly as it was after alterations, and we can then probably answer your query.

E. G. PIPE.—The model was fitted with a cane protector, see Fig. 2. Any protector of the usual type can be fitted—the one used was made to slide stiffly along the underside of the T. An inch to two inches—it is immaterial. The model now being no longer in existence we cannot say exactly. The paper you had previously referred to.

B. G. FLEET.—If you have carefully followed what has been said in these columns during the last few months *re* power motors—you should, we think, know that any form of electric motor is absolutely useless—fix a propeller to it, put it on a pair of scales and see for yourself what thrust you can get from it in proportion to its weight. Unless you are a first-class mechanic you cannot possibly turn even *good* ordinary steam engine and boiler fittings into a plant of any use to fly a model aeroplane successfully. And if you are such then it will pay you better to construct everything specially. You *must* employ a flash boiler—superheated steam, a benzoline or similar lamp, specially made valves and cylinders—silver soldering or brazing, special lubrication, no packing of the ordinary kind, &c. Try some experiments, by all means, if you like—but for success, everything must be specialized.

THE KITE AND MODEL AEROPLANE ASSOCIATION.

OFFICIAL NOTICES.

English Model Records.—In view of the confusion that appears to exist with regard to model records, and in response to numerous inquiries, we herewith publish the English official record trials to date, these being observed and deduction made for wind velocity:—

February 17th. Observers: Messrs. T. H. K. Clarke, V. E. Johnson, G. P. Bragg Smith and W. H. Akehurst. Distance (hand launched): R. F. Mann, 320 yards; C. R. Fairey, 230 yards; R. P. Grimmer, 157 yards. Duration (hand launched): C. R. Fairey, 60·4 secs.; R. F. Mann, 43 secs.; R. P. Grimmer, 34·8 secs.

April 13th. Observers: Messrs. V. E. Johnson, E. W. Twining and W. H. Akehurst. Distance (hand launched): G. Rowlands, 398 yards. Duration (hand launched): H. R. Weston, 64 secs.; C. R. Fairey, 55 secs.; R. Stedman (Aerial Engine Works), 50 secs.; G. Rowlands, 44 secs.; W. E. Evans, 30 secs.

By the above it will be seen thas G. Rowlands holds the distance record and H. R. Weston the duration record.

Next Official Trials.—The next officially observed flights for registration of model aeroplane performances for the purpose of establishing records will be held on Saturday, June 15th, on the 100-acre field, Greenford, by invitation of the Ealing Club. All those would-be record holders should note the date and come along, as the ground is one of the finest round London. The best way is *via* Paddington to Perivale Halt Station. If by District, to Westbourne Park and change into motor train for Perivale Halt, or to Hanwell and short walk across the fields *via* Green Man Hotel.

Competitions.—On Saturday, May 25th, the annual contest for the Baden-Powell Challenge Shield for the best kite of the year was held on Wimbledon Common, on a light wind, the average being under 6 miles per hour; the holder, A. W. Brown, of Croydon, again carrying off the shield and gold medal of the Association, for the third year in succession, Mr. F. T. Pringuer being second and winning the silver medal, and Mr. H. W. Browse, of Catford, third and winning bronze medal.

Mr. T. Gregg acted as clerk of the course, and the council wish to record their thanks for his work on behalf of the Association.

Judges: Mr. C. R. Fairey, Mr. C. Brogden, and Mr. W. H. Akehurst.

Out of 18 competitors 16 competed, but two competitors, Messrs. Davies and B. S. Varnels, retired.

Mr. C. Pringuer ably assisted the judges as bugler.

Model Competition, National Aviation Ground, Harrow, June 8th, at 3 o'clock. Entries close first post June 5th.

Model Engineer (Duration) Competition for Models (Open to the World).—Models must not weigh less than 4 ozs.: free to members; non-members' entrance fee, 2*s.*; flown on efficiency test.

$$\text{Duration of flight} \times \frac{\text{total weight of machine,}}{\text{weight of rubber.}}$$

Prizes: 1st, Challenge Cup and silver medal, presented by Editor of the *Model Engineer*; 2nd, silver medal of the Association; 3rd, bronze medal of the Association.

Rules.—1. Competitors may submit models of any kind; 2. Models must not weigh less than 4 ozs.; 3. Competitors must be at the judges' flag at 2.30 o'clock. Those not present at that time will be disqualified; 4. Models to be timed from time of starting to time of landing, or till they disappear from the judges' view;

Official Results.

Place.	Competitor.	Kite. Make.	Kite. Type.	Marks. Angle.	Stability.	Collapsibility and strength of reconstruction.	Total.
1	A. W. Brown	Owner	Box and wing	40	26	28	94
2	F. T. Pringuer	Crown	Double box and wing	32	26	28	86
3	H. W. Browse	Owner	Triangular box and wing	34	24	25	83
4	R. H. Lanchester	Owner	Triangular box and wing	29	24	26	79
5	E. W. Twining	Owner	Twining soaring kite	30	23	24	77
6	H. A. Stewart (Tie)	Owner	Single plane rhombus	30	21	23	74
	J. C. H. Warwick (Tie)	Brookite	Single box	28	23	23	
7	S. Hardstone (Tie)	Owner	Triangular box and wing	30	20	23	73
	G. Bance (Tie)	Owner	Box and wing	27	24	22	
8	W. Jones	Unikite	Unikite	24	21	25	70
9	Miss Gregg (Tie)	Roloplane	Two planes	25	20	22	67
	W. Crake (Tie)	Unikite	Unikite	22	20	25	
10	F. P. Eads	Roloplane	Three planes	24	21	20	65
11	P. Jell	Owner	Box and wing	17	20	18	55

5. Models must be hand launched ; 6. Each competitor is entitled to three trials if time permits.

Competition, June 22nd, at 3 o'clock.

Junior Duration Competitions for Models made by Competitors, aged 16 and under :—Free to members ; non-members' entrance fee, 1*s.* 6*d.*

Rules.—1. Competitors must be at the judges' flag at 2.30 p.m. Any competitor not present at that time will be disqualified ; 2. Models must not weigh less than 4 ozs. ; 3. Competitors will be allowed to make reasonable repairs, at the discretion of the judges ; 4. Models must be launched by hand ; 5. Models to be timed from time of starting till they land or disappear from judges' view. In awarding prizes, originality of design will be considered ; 6. Each competitor is entitled to two trials, if time permits ; 7. Competitors may submit models of any kind provided they are their own work throughout ; 8. In this competition each competitor must obtain the signature of some responsible person who knows that the model has been made throughout by the competitor, including propellers.

W. H. AKEHURST, Hon. Sec.

27, Victory Road, Wimbledon.

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PROGRESS OF FLIGHT ABOUT THE COUNTRY.

Notes regarding Clubs must reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.

MODEL CLUBS.

Aero-Models Assoc. (N. Branch) (Sec., MALCOLM B. ROSS, 15, HIGHGATE AVENUE, N.).

AT Finchley on Saturday, H. O. Murray again equalled his previous duration record or 69 secs., Corder's "A" type 49 secs., and very high flying. Fletcher, with reconstructed vertical-twin type out testing. Hyndesley with old tractor "Morane" type. Pidsley smashed old 8 oz. 'bus. All-Tractor meeting June 1st. Tractor rising-off-ground meeting *v.* Palmer's Green in a week or two.

Birmingham Aero Club (Model Section) (Secs., R. COBHAM and G. H. WOOD, 8, FREDERICK ROAD, EDGBASTON).

GOOD practice at Billesley last week. Best, E. Trykle 79 secs., L. West 58 secs., G. Haddon Wood 71⅝ secs.

Whit-Monday 17 members journeyed to London. A splendid breakfast was given to the members by Mr. W. E. Evans, after which the journey was made to Greenford. What took place at Greenford the less said the better with regard to the Birmingham members' flights. It is hoped that the London clubs will pay return visit to Birmingham in August.

Blackheath Aero Club (Hon. Sec., A. E. WOOLLARD, 48, HAFTON ROAD, CATFORD, S.E.).

SATURDAY, at Grove Park, Mr. J. H. Dollittle flew a 0-1-1-P 2 "A"-frame, Mr. Bailey an "A"-frame, Mr. Woollard 2 machines, and Messrs. Holland, Plummer Morgan, and Egelstaff their usual type.

Sunday, Messrs. Dollittle, Whitworth, Trask, Plummer, Hunt, and A. B. Clark, whose re-appearance was welcomed, were flying.

Whit-Monday team chosen as follows : Messrs. Dollittle, Whitworth, Plummer, Hunt, Trask, Waghorn and Woollard, but owing to mishaps, Hunt and Trask were unable to compete. The competition was excellently organised considering the small notice, and many thanks are due to Messrs. V. E. Johnson, W. E. Evans and B. J. Kirchner. Needless to say, the result (reported elsewhere) of the competition was pleasing to the Blackheath team.

On June 8th the club is meeting the Ealing Club in a distance and duration contest.

Brighton and District Model Aero Club (Hon. Sec., A. VON WICHMANN, "KINGSLEIGH," KINGSWAY, HOVE).

HIGHLY successful week-end's work. Flying at Shoreham Aerodrome on Saturday, Sunday and Whit-Monday. Club secured big advertisement, and got good notices in local Press. Von Wichmann, Trollope, Orford, White, Knowles, Williams, Bate and Burghope out. Fine exhibition kept some hundreds of people interested. Bate's model—he brought about a dozen—in the air continuously. He did 50 and 60 secs. often, also high flights. Burghope's big 37-oz. Nieuport (50-in. span) did 51 flights during week-end. Only damage was to skid. New propeller took her 80 and 85 yard flights off rough ground, and many flights of over 120 yards when launched by hand ; Longeot over 130 yards (off hangar roof) ; stability perfect, and speed about 28 m.p.h. ; wings covered with signatures.

Bristol Model Flying (Sec., R. V. TIVY, 3, ROYAL YORK CRESCENT, CLIFTON).

MEETINGS will be held to-day (Saturday) and on June 8th at the Sea Walls at 3 p.m. A meeting will be held at the Zoological Gardens to test competition models, which should be completed a week or two before the date of the competition—June 27th (7–8 p.m.).

Ealing and District Aero Club (Sec., B. J. KIRCHNER, 1, QUEEN'S GARDENS, EALING, W.).

SATURDAY, Mr. Beeching with single propeller mono. obtained durations of 26, 29, 25, 30 and 31 secs. Later he was flying his "Baby" twin-propeller model, (length 12 ins., span 11 ins.) ; longest flight, 120 yards. Mr. L. Roche tested his first 3-ft. 0-1-1-2 P with which durations of 33, 35 and 40 secs. were obtained.

Sunday, Mr. Houlberg's model flew 60 secs. at first attempt—Mr. Davies' 0-1-1-2 P flew 40 secs., Mr. Beeching's with single propeller mono. 28 and 31 secs., Mr. L. Roche up to 50 secs. The results of the four-sided contest are recorded elsewhere in this issue. The five best flights for Ealing gave an average of 40⅘ secs. The machines belonged to the 0-1-1-2 P type except Mr. Chilcott's which had a loaded elevator.

Mr. Houlberg must be congratulated on having brilliantly beaten the British duration record (64 secs.) by official flights of 71 and 89 secs.

Hackney and District Aero Club (Sec., B. H. LONGSTAFFE, THE HOLLIES, JENNER ROAD, STOKE NEWINGTON, N.).

DURATIONS last Saturday : Louch, 55 secs. ; Gittus, 40 secs. ; Miss L. Bond, 34 secs. ; H. G. Bond, 32 secs., with 0-1-1-P2 type ; Marmin, 27 secs., with single screw ; Lewin, 21 secs. High flying by Louch and Gittus. Return contest with Paddington Aero Club postponed to June 8th. Club members desirous of exhibiting models at Spensley Hall, Friday, June 7th, should communicate with the secretary as soon as possible.

Paddington and Districts Aero Club (Sec., W. E. EVANS, 133, BUCHANAN GARDENS, HARLESDEN).

RESULT of Whit-Monday inter-club contest between Birmingham, Blackheath, Ealing, and Paddington Aero Clubs, held at 100-acre field, Greenford. Blackheath won easily with an average of 58 secs., Paddington next 48⅕ secs., Ealing 40⅘ secs., Birmingham 35⅘ secs. Individual best flights were as follows : Blackheath—Whitworth, 70 ; Dollittle, 69 ; Woollard, 57 ; Waghorn, 49 ; and Plummer, 45 secs. Paddington—Dutton, 73⅘ ; Chalfont, 51 ; Cannell, 50 ; Lane, 43⅘ ; and Woolley, 23⅘ secs. Ealing—Houlberg, 89 ; Smith, 51 ; Roche, 38⅘ ; Chilcott, 25 ; and Kirchner, 10 secs. Birmingham—Trykle, 55⅘ ; Wilde, 51 ; Wood, 29⅘ ; Mason, 24 ; and McManus, 19 secs. Weather conditions were really good for model flying, but it was evident that Birmingham would have made a better show if there had been a perfect calm. Their models were all single propeller machines with one exception. All the London club's models were twin-propeller machines.

The return inter-club contest with Hackney and District Club at Hackney Marshes on June 8th.

The club duration competition for medals was postponed.

Reigate, Redhill and District Aero Club (Sec., H. V. MAY, 4, LONDON ROAD, REIGATE).

NORTON, Osborne, Morris, May, Sutton and Lewis all flying well during week at Earlswood or Bucklands. Norton got 208 yards with new monoplane ; Lewis, with "Almono," over 100 ft. high.

Whit-Monday. Norton, Sutton, Morris, Lewis, Osborne and May gave splendid show for quite a large crowd of spectators. After dark several illuminated flights were put up. The Rawson Cup competition, Saturday (to-day), at Earlswood, at 4 o'clock sharp.

Scottish Aer.S. Model Aero Club (6, MCLELLAN STREET, GOVAN).

ON Wednesday last week Mr. J. S. Gordon, with new biplane at Norwood Park, Dumbreck, had several brilliant flights at high altitudes. On Thursday, Messrs. Balden and Arthur made good flights, at Great Western Road Boating Loch, with hydro-aeroplanes. Mr. J. S. Gordon testing new racer monoplane at Dumbrech. On Saturday a hydro-aero. meeting took place at Victoria Park, White-inch. Mr. C. F. Arthur's big hydro-mono. got off the water several times in 3 ft., and flew distances of 150 ft. to 200 ft. before landing. Mr. J. C. Balden also made some excellent trials, with similar results to Mr. Arthur's. Much amusement was caused by several of the swans trying to emulate the feats of the models.

To-day (Saturday) a flying demonstration will be given before the inmates of the Broomhill Homes, Kirkintilloch. Members will travel by the 1.40 p.m. train from Queen Street Station.

On Tuesday, June 4th, general meeting in the Christian Institute, Bothwell Street, Glasgow, at 7 p.m.

South Norwood District Aero Club (240, HOLMESDALE ROAD).

MONDAY, last week, tests with Hooker's new tractor ; Streeter flying 4-footer, duration 61 secs. and distance 310 yards. Saturday Streeter flying 4-footer in 30 m.p.h. wind.

Anyone wishing to join the club should communicate with the secretary, Mr. C. Streeter.

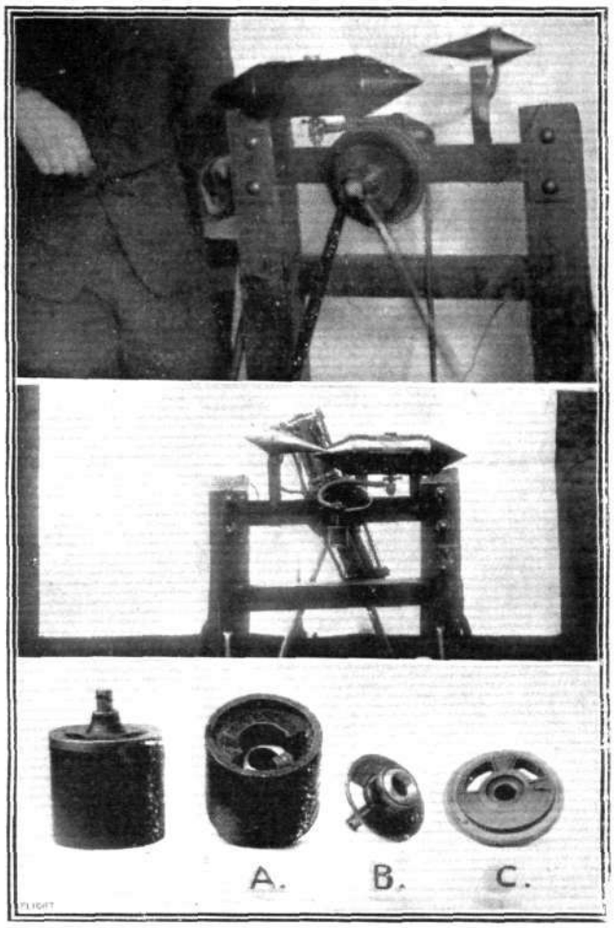
CORRESPONDENCE.

**** *The name and address of the writer* (*not necessarily for publication*) MUST *in all cases accompany letters intended for insertion, or containing queries.*

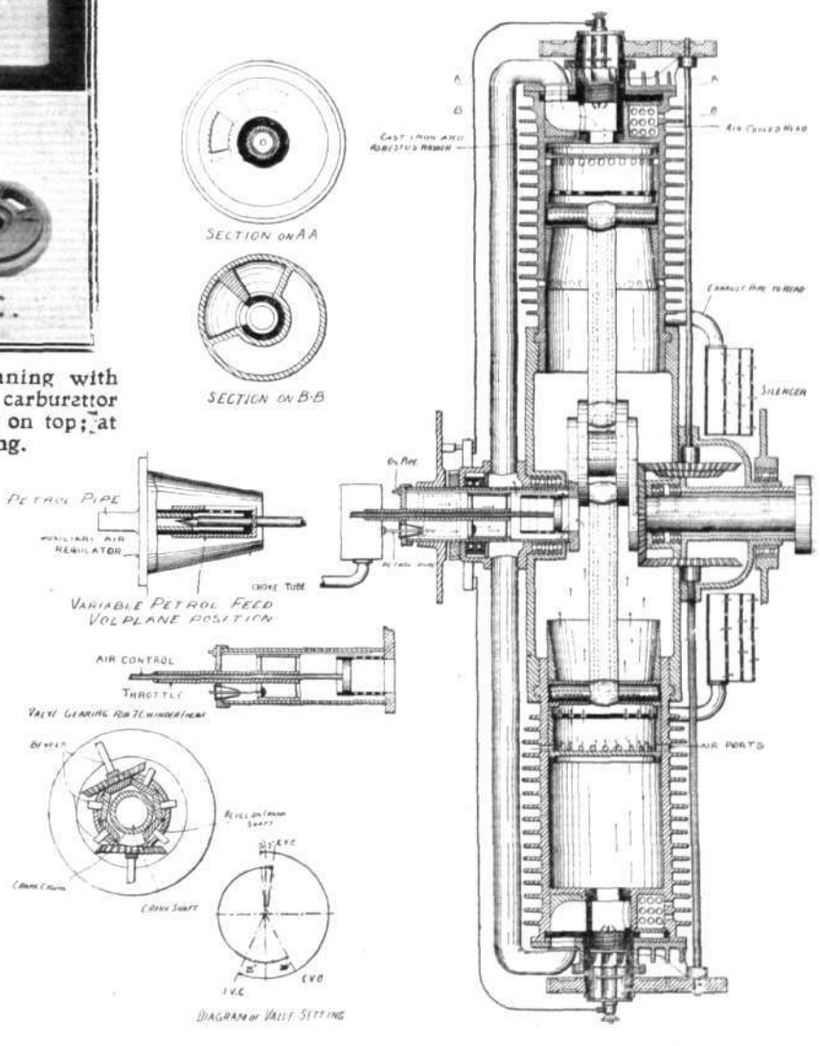
Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

The Cochrane Engine.

[1563] Now that the question of aeroplane engines is prominently before the public, I think the enclosed photos and diagrammatic drawing of my new revolving-cylinder rotary-valve engine may be interesting to some of FLIGHT readers. The chief features of this engine are improved internal cooling, positively operated exhaust and inlet-valves and throttle control. I know that the majority who profess to represent British technical opinion on the subject have prophesied the death of the revolving-cylinder engine within the next 18 months, but I venture to think that it will still retain its premier position if internal cooling can be improved and mechanically-operated valves used, more horse-power will then be developed on the same bore and stroke by increasing the compression, and less lubricating oil will be used. If the engine can be throttled greater economy in petrol will also be possible. I know the Gnome and Indian Motor Bicycle Co., of America, and others have spent large sums of money in trying to produce a successful revolving cylinder engine with mechanically-operated inlet-valves, but the trouble has always been bad internal cooling, and the lubricating oil collected inside the pistons by centrifugal force becomes carbonized, the excessive heat causing the pistons to seize up after the engine has been running for a short time. I rectify this difficulty by drawing the air for the carburettor through the cylinders and piston walls when the piston is at the bottom of its stroke, this system keeps the pistons and cylinders cool, warms the air for the carburettor, and sweeps all the oil which escapes from the bearings up the induction-pipe to lubricate the rotary-valve in the head of the cylinder. Great economy in petrol and variation of horse-power can be effected by a careful adjustment of the throttle and air-valves, shown working in crank-shaft, the quality of the mixture can be varied by moving the air-valve, the quantity by the throttle. When the machine is *vol planing* the throttle is pulled open and a needle-valve, shown, shuts off the petrol altogether, only pure air passes through the cylinders, and the engine is controlled by the throttle-lever instead of the spark. Although this engine works at a pressure of 5½ atmospheres, it does not get excessively hot; this I attribute to the large free ports and the exhaust and incoming-gases passing through the same valve-port. The disc-valve is also isolated from the combustion-chamber, and is effectively cooled by the air-cooled head and cover. No. 1 photo shows the experimental engine running at 2,000 revs. per min.; No. 2, the carburettor side of the engine; No. 3, the valve in its housing, the valve-housing, the valve, and valve-cover. The advantages this rotary valve has over other valve-gears are: that it is positively operated, noiseless, and without vibration at high speeds, the pressure on the valve-face is centralized and reduced to an area equal to the area of the port in the disc-valve, there is a double seal on the gases, which makes leakage impossible. The valves were a loose fit five months ago when the engine was completed, and your representative saw it running; now the oil has carbonized all round the valve-seating the compression is equal, if not better, than a mushroom-valve engine with its valve freshly ground in. Within the last five months I have asked over twelve leading makers of British engines to send a representative to see the engine running, with a view to taking it up; so far, none have come. It is now being placed with an American firm, who have convinced themselves that



COCHRANE'S ENGINE.—At top engine running with rotary valves at 2,000 r.p.m.; in the centre the carburettor side is seen, showing induction-pipe and gearing on top; at bottom the rotary valve cover and housing.



the theory of the valve-gear is sound, although they have not seen an engine fitted with it running. I believe the day of the rubber-stick model aeroplane is nearly over, and there is now a big field for a reliable vibrationless model petrol engine for model aeroplanes which will not weigh more than 6½ lbs. complete with all accessories, including propeller. From the experience I have gained these last four years experimenting with petrol motors, I now propose to cater for this demand by building 24 revolving-cylinder engines right away; the design will be similar to the enclosed, the engines will have three cylinders, which gives a perfect balance, the bore and stroke will be 1½ in. by 1⅝ in., cylinders, crank-case, and pistons made of steel tubing, cylinders welded into crank-case, weight complete in running order 6½ lbs., ignition, miniature trembler-coil and accumulator; price complete, £8 10s. In conclusion, I may say I am now in a position to build engines of any horse-power fitted with this valve-gear, with either stationary or revolving cylinders, and I shall be pleased to have the valve-gear criticised by some of the technical readers of FLIGHT.

It has not been possible to take any B.H.P. tests with this experimental engine, owing to the awkward design, and there is a lot of vibration due to the uneven firing of the twin cylinders on the crank, but it is very flexible and runs at very high speeds, at which a mushroom-valve engine would be very inefficient; the new 3-cyl. engine is designed so that the B.H.P. can be taken, and I hope to get a speed of between three and four thousand revs. per min.

26D, Clarges Street, W. WILLIAM COCHRANE.

Direct *v.* Reaction Control.

[1564] In your note of the fatal accident to Mr. Fisher, you state that he lost control, and may, in fact, "have been pitched against the control lever, thus exaggerating the diving attitude of his machine at the moment when it most needed to be diminished."

May I be allowed once more to point out that this type of accident would always be liable to occur so long as the present practice is adhered to of connecting up the control levers to the elevating and warping mechanism so that the machine directly copies the movement of the control lever, and that the only safe way of controlling an aeroplane in a sudden emergency which disturbs the balance of the pilot is to reverse the method of attachment, so that the machine would be righted by the movement which the pilot instinctively makes in attempting to right himself.

In your issue of August 27th, 1910, you were good enough to insert an article in which I attempted to set out the reasons for this suggestion. I have seen nothing in the interval to alter the opinion then submitted that, comparing the two possible methods of control, the direct and the inverse or "reaction," the inverse method would be the easier to learn in the first instance, and far safer at an emergency. The advantage of the inverse method would be especially noticeable in training Naval pilots, for if the warping and elevating mechanism are combined in a single control head, this head may be considered as exactly analogous to the handle of a double paddle, like that of a "Rob-Roy" canoe, by means of which the pilot presses down on to the air, and so lifts the machine in the required direction, just as the man in the canoe presses down the paddle on to the water in order to balance the canoe at an emergency.

If your explanation of Mr. Fisher's accident is correct, it would appear that the original dive took place so rapidly that the pilot was thrown forward against the control lever. If this had been connected in the inverse method, the fact that the pilot was thrown against the lever, and pressed the lever down in his effort to regain his own balance, would have automatically tended to restore the aeroplane to a level keel.

Let us go back to the analogy of the boat rather than to the analogy of the motor car, for it is certain that in the moments of the greatest emergency, the natural instinct of man is to think of his own safety, and to attempt to readjust *his own balance* by clutching at his levers like a drowning man at a straw, rather than to think of how to readjust the balance of the machine over which he has lost control.

King's Bench Walk. R. A. S. PAGET.

Floats as Silencers.

[1565] It has struck me that the floats on a hydroplane could possibly be used as silencers, and I make this suggestion for what it is worth.

Stafford. F. WEBB.

Nomenclature.

[1566] With reference to my letter (N° 1522) in your issue of April 6th.

As I see you have been making an attempt to introduce the word "aquaplane," may I suggest that the words "aqua-biplane" and "aqua-monoplane" would be the most suitable when it is necessary to distinguish between the two types of machines.

Vincent Square, S.W. C. NICHOLSON.

A Promising Australian Flyer.

ONE of the foremost workers in the cause of aeronautics in Australia has been Mr. Lindsay Campbell, of the Queensland and New South Wales Aero Clubs, who started experimenting with Hargreave kites in 1893 and has been working with gliders for the last year or two. He came to England at the end of last March in order to get his *brevet* and after a very short period of tuition—only fourteen working days—qualified for his *brevet* on May 19th. The accurate nature of Mr. Campbell's work can be judged from the fact that his certificate states that he landed "on the mark." In the altitude test he took his machine up to 800 feet and completed the ten figure eights in masterly fashion. Now that the Commonwealth Government is taking up the subject of aviation, it is probable that many other Australians will be inspired by Mr. Campbell's example and come over in order to receive practical instruction and obtain their certificates.

Barcelona to have a Meeting.

ARRANGEMENTS are well forward for a meeting to be held a Barcelona from June 8th to 18th. It is announced that Paulhan and Sanchez-Besa will give exhibitions on hydro-aeroplanes, and that Laurens, Bouvier, Molla, Barra and Ehrmann have promised to take part. A prize is to be offered for a flight from Paris to Barcelona in not more than four stages.

Change of Address.

MESSRS. THE WESTON HURLIN CO. inform us that they have now removed to new works at 22, Shirland Mews, Shirland Road, Paddington, W.

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PUBLICATION RECEIVED.

The Aeroplane in War. By Claude Grahame-White and Harry Harper. London: T. Werner Laurie, Clifford's Inn. 12*s.* 6*d.* net.

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Aeronautical Patents Published.

Applied for in 1911.

Published May 30th, 1912.

22,675. A. E., H. L., AND H. O. SHORT. Propelling mechanism for flying machines.
5,253. J. W. HARRISON. Flying machines.
27,405. A. VON WILLISCH. Flying machines.

Applied for in 1912.

Published May 30th, 1912.

5,282. KITCHEN. Flying machines.
5,966. PORTER. Aeronautical machines.

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